University of Alberta

Addressing Natural Resource Policy Complexities and Change

by

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ABSTRACT

The contribution of political science within the natural resources discipline is examined in this dissertation. A macro-level, a meso-level, and an empirical level of inquiry are employed in order to understand complexity and change throughout the Canadian natural resources sector.

Chapter Two considers the importance of staples production when studying the state. The competitive state, a reply to the declining Keynesian National Welfare State (KNWS), is adopted in order to reconcile the continued importance of natural resource production in many parts of Canada with the changing composition of capitalist production and globalization.

Chapter Three addresses two significant gaps encountered by all policy scientists: a lack of interaction between policy-making levels (national domain, provincial policy communities, and communities) and an underdeveloped or incomplete conception of policy-making organizations. As a result, popular policy frameworks have a limited capacity. Complexity theory and fuzzy logic are adopted, leading to the development of a framework allowing a simultaneous consideration of the different levels of policymaking and an organization's capacity and commitment.

A structural equation model is developed in Chapter Four in order to examine the role of informal coordination networks and the concern about climate change.

The data from this study came from responses to an online web survey of Canadian prairie agriculture, forestry, and water based policy elite. The survey garnered 356 responses (41.8% response rate). The results found that respondents looked to the federal government as a potential ally. However, the federal government did not reciprocate to the other major organizational clusters (agriculture and forest industry, provincial government, environment groups and research organizations).

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TABLE OF CONTENTS

Chapter 1 – ADVANCING THE NATURAL RESOURCE POLITICAL SCIENCE RESEARCH AGENDA 1
Homo Politicus and natural resource management 1
Government, governing, and governance 1
Neo-pluralism 1
Natural resources, forestry, and climate change 2
Policy-making levels 3
Chapter Two overview 3
Chapter Three overview 4
Chapter Four overview 6
Chapter Five overview 9
Literature cited 10
Chapter 2 -THE EVOLVING STATE AND THE STAPLES THESIS – THEN AND NOW 12
Introduction 12
Chapter outline 13
The staples thesis and natural resource exploitation in Canada 14
Natural endowments, early staples, and colonial expansion 16
Agricultural development and the wheat economy 17
Capital intensive staples and the rise of the new industrialism 17
The evolving state and staples production 18
Colonial and emergent Westphalian states 20
The emergent organizational state and industrial expansion of natural resource sectors 22
Keynesian National Welfare State: A legacy of persistent underdevelopment 24
The post-staples economy – Whither the role of staples? 26
Contemporary staples production and the competitive state 29
Continued importance of staples production in Canada 29
Globalization and spatial considerations of the state 30
Globalization and competitive states 31
Governance 34
Reconsidering policy communities and networks as drivers of competitive states. 37
Conclusion 41
Literature cited 42
Chapter 3-NAVIGATING COMPLEX AND FUZZY POLICY LANDSCAPES 51
Introduction 51
Chapter outline 53
Conceptions of the current forestry policy landscape 54

New theoretical challenges 58
The organizational dynamics gap 59
Power and the state sovereignty gap 67
Incorporating complexity theory and fuzzy set theory 68
Complexity-based policy process framework 73
A forest-based issue case study: the Mountain Pine Beetle 76
Concluding remarks 82
Implications for policy research 82
Critical introspective on future research directions 82
Literature cited 84
Chapter 4 - COORDINATING FUTURE CLIMATE CHANGE POLICIES IN THE CANADIAN PRAIRIE AGRICULTURE, FORESTRY, AND WATER SECTORS 94
Introduction 94
Outline 94
Background – Climate change in Canada 95
Research hypotheses 98
Data and methodology 103
Data 103
Methodology: Survey content 103
Structural equation model 104
Results 105
Describing the respondents 105
Network of informal coordination 106
Measuring core beliefs 110
Structural equation model variables 112
Structural equation model results 113
Discussion and conclusion 118
Literature cited 121
Chapter 5 –COMPLEXITY AND CHANGE: WHAT DOES IT MEAN FOR NATURAL RESOURCE POLICY MAKING? 124
Introduction 124
Opening the Black Box: Contributions to multi-disciplinary research 124
Contributions to the discipline 125
Limitations 126
Future research directions 127
Literature cited 128
APPENDICES 129
Appendix A. Hofferbert's funnel of causality 130
Appendix B – Survey questionnaire and results from the Resource Management Policy and Climate Change Survey 130
Appendix B – Survey questionnaire and results from the Resource Management

Policy and Climate Change Survey 131
Appendix C. Three basic equations of a structural equation model and their coefficient and covariance matrices.....154
Appendix D – Tabular results of informal networks 156
Appendix E – Factor scores: Structure of deep normative policy core beliefs 157

LIST OF TABLES

TABLE 1-1. APPROACHES TO POLICY RESEARCH 3
TABLE 2-1 HISTORICAL EVOLUTION OF THE STATE IN RESPONSE TO CANADIAN ECONOMIC ORGANIZATION 19
TABLE 2-2. ECONOMIC INDICATORS FOR CANADA'S NATURAL RESOURCE SECTORS 27
TABLE 2-3. THE ROLE OF RESOURCES IN PROVINCIAL EXPORTS: 1997-2001 AVERAGES 29
TABLE 2-4. MODES OF COORDINATION WITHIN COMPETITIVE CAPITALIST STATES 35
TABLE 3-1. POLICY COMMUNITY AND POLICY NETWORKS: THE RHODES TYPOLOGY 55
TABLE 3-2. WILKS AND WRIGHT TYPOLOGY 55
TABLE 4-1. INITIAL ORGANIZATIONAL CLUSTERS 105
TABLE 4-2. STRUCTURE OF DEEP NORMATIVE CORE BELIEFS 110
TABLE 4-3. SUMMARY OF VARIANCE FOR FACTORED NORMATIVE CORE BELIEFS 111
TABLE 4-4. ECOLOGICALLY BASED NORMATIVE POLICY BELIEFS 111
TABLE 4-5. LIST OF MODEL VARIABLES 112
TABLE 4-6. DESCRIPTIVE STATISTICS OF VARIABLES USED IN THE MODEL 113
TABLE 4-7. MAXIMUM LIKELIHOOD ESTIMATES FOR ALLY COORDINATION NETWORK 114
TABLE B-1. ORGANIZATIONS REGARDED AS ALLIES (SHARING INFORMATION, DEVELOPING JOINT POLICY POSITIONS, VOLUNTARILY MODIFYING ORGANIZATION'S BEHAVIOR) 156
TABLE B-2 ORGANIZATIONS REGARDED AS ALLIES (SHARING INFORMATION, DEVELOPING JOINT POLICY POSITIONS, VOLUNTARILY MODIFYING ORGANIZATION'S BEHAVIOR) (BASED ON THE RATIO BETWEEN THE RESPONDENT'S ORGANIZATION AND THE IDENTIFIED ORGANIZATION) 156
TABLE B-3. ORGANIZATIONS REGARDED AS OPPOSITION 156

LIST OF FIGURES

FIGURE 1-1. THE RANGE OF COMPLEXITY DYNAMICS IN PHYSICAL AND HUMAN PHENOMENA 6
FIGURE 1-2. CONCEPTUAL FRAMEWORK OF THE STRUCTURAL EQUATION MODEL 8
FIGURE 2-1 – A TYPICAL POLICY COMMUNITY 36
FIGURE 2-2. HYPOTHETICAL POLICY COMMUNITY IN A COMPETITIVE STATE 39
FIGURE 2-3. THE COMPETITIVE STATE AND STAPLES-BASED POLICY COMMUNITIES 40
FIGURE 3-1. 'PRESSING' CANADIAN FOREST POLICY ISSUE AREAS AS DEFINED BY THE NATIONAL FOREST STRATEGY COALITION 52
FIGURE 3-2. AN EXAMPLE OF A FOREST ISSUE AND ITS RELATED SUB-ISSUES 53
FIGURE 3-3. LEAVITT'S DIAMOND: A MODEL OF AN ORGANIZATION 60
FIGURE 3-4. MULTIPLE POLICY MAKING LEVELS (SYSTEMS) 65
FIGURE 3-5. THE RANGE OF COMPLEXITY DYNAMICS IN PHYSICAL AND HUMAN PHENOMENA 72
FIGURE 3-6. ATTRIBUTES OF NON-LINEAR SYSTEMS 72
FIGURE 3-7. THE RANGE OF COMPLEXITY DYNAMICS IN POLITICAL PHENOMENA 73
FIGURE 3-8. MAIN COMPONENTS OF A COMPLEXITY-BASED POLICY PROCESS FRAMEWORK 74
FIGURE 3-9. THE RANGE OF COMPLEXITY DYNAMICS IN POLICY MAKING 79
FIGURE 3-10. RANGE OF COMPLEXITY DYNAMICS IN FOREST POLICY MAKING (T_1) 80
FIGURE 3-11. RANGE OF COMPLEXITY DYNAMICS IN FOREST POLICY MAKING (T_2) 80
FIGURE 4-1. CONCEPTUAL MODEL OF THE HYPOTHESES TESTED 102
FIGURE 4-2. ORGANIZATIONS REGARDED AS ALLIES (SHARING INFORMATION, DEVELOPING JOINT POLICY POSITIONS, VOLUNTARILY MODIFYING ORGANIZATION'S BEHAVIOR) 107
FIGURE 4-3. ORGANIZATIONS REGARDED AS ALLIES (SHARING INFORMATION, DEVELOPING JOINT POLICY POSITIONS, AND VOLUNTARILY MODIFYING ORGANIZATION'S BEHAVIOR) (BASED ON THE RATIO BETWEEN THE RESPONDENT'S ORGANIZATION AND THE IDENTIFIED ORGANIZATION) 108
FIGURE 4-4. ORGANIZATIONS REGARDED AS OPPOSITION 109
FIGURE 4-5. ALLY COORDINATION NETWORKS MODEL WITH STANDARDIZED EFFECTS (N=356) 116

Chapter 1 – ADVANCING THE NATURAL RESOURCE POLITICAL SCIENCE RESEARCH AGENDA

Homo Politicus and natural resource management

This dissertation's underlying agenda is to promote and advance the scholarly role of political science within the natural resource discipline. The following three chapters achieve this objective by addressing a recurring theme that has challenged the accepted understanding of contemporary natural resources policy-making: complexity and change. Equally important is the advancement of political science itself, both theoretically and empirically. The first two chapters are examinations and reevaluations of the theoretical assumptions belonging to the macro-level inquiries of the advanced modern capitalist state and the meso-level revelations of policy process frameworks. Chapter Four, is a quantitative study, employing a structural equation model measuring the role of informal networks in future climate change policy-making. This chapter is a particularly significant contribution to Canadian political science, which has rarely seen research of this type.

Government, governing, and governance

At the heart of *homo politicus* are concerns regarding government, governing, and governance. Scholars and those 'on-the-ground' practitioners have questioned our current institutions, beliefs, and approaches to decision-making in light of change and complexity. Public policy, namely what governments choose to do or not to do, is at the heart of this debate (Dye 1972). At the broadest level, this debate has raised questions about the ability of the government, the means that we are governed, and new emerging forms of governance. Government, in this context, refers to those who occupy positions of the highest authority and who ultimately make decisions. Government remains the sole institution that has the final say on policies and, although debated, still retains greater legitimacy and coercion than all other societal actors (Offe 1984; Lemieux 2000). Governing refers to the guiding, steering, controlling or managing of all facets of life by both government and societal actors (Lemieux 2000). Governance is also increasingly referred to as a particular new form of governing that has been described by Rhodes (1996) as a "self-organized" network of private and public actors that are defined within specialized sectors such agriculture, forestry, health, finance and banking, transportation, or education. Thus, the role of governing, government, and governance in light of change and complexity is the motivation of this dissertation.

Neo-pluralism

In terms of understanding broad governance mechanisms, neo-pluralism is the epistemological starting point for this dissertation. Neo-pluralism, a reconsideration

of pluralist theory, is consolidated along two lines of research: political power and issue formation (McFarland 2004). Neo-pluralist theory presents a sophisticated analysis of the complexities inherent within the fragmented modern state (Dunleavy and O'Leary 1987). Neo-pluralist theory is a well developed literature that situates the state within advanced modern industrial society. Problems of modernity, in particular the failure of the Keynesian National Welfare State (KNWS), neo-pluralists argue, have led to the increasing differentiation in the systems of society and the state. Neo-pluralist dwell on the problems of modernity and state crisis. Their goal is to avoid analyzing social and political problems with crude, anachronistic, or ideological theories or frameworks. Instead, they advocate a sophisticated liberal analysis centering on the operations of large corporations and the modern extended state. They urge the necessity of updating intellectual toolkits to cope with the inherent complexity of modern social systems (Dunleavy and O'Leary 1987).

Neo-pluralism's intellectual roots are eclectic. It beginning were marked from political scientists, best represented by Lindblom's (1977) seminal piece; *Politics and the markets*, unorthodox economists, such as Galbraith [1962;1969;1974]; Williamson 1975; or Myrdal 1975); as well as organizational theorists (Etzioni 1968; Laumann and Knoke 1987) and cultural theorists (Habermas 1971; Bell 1973). Neo-pluralists highlight the structural differentiation within the state, increased control over societal resources, and expanded intervention into the economy and society. The states interaction with organized interest groups becomes a focal point in neo-pluralist research agenda (Dunleavy and O'Leary 1987). Williamson (1975) points to the influence of social values and institutional arrangements on economic arrangements, namely the importance oflarge corporations and the extended state. The boundaries between the public sector and private interest groups become blurred in the policy making process. A specialization across different sectors leads to the professionalization of the public administration (Richardson et al. 1982). The growth and engagement of new societal policy actors has lead to a "hollowing out" of the state (Rhodes 1994; Milward and Provan 2000). The next three chapters rely on a neo-pluralist context to consider the current role of government, the challenges of governing, and the unfolding trends in governance in these rapidly changing and complex times.

Natural resources, forestry, and climate change

This dissertation began with the intention of exclusively examining the climate change issue within the prairie agriculture, forest, and water sectors. However, the inclusion of the following two theoretical chapters indicates that broader implications across the natural resource sector will be realized. Chapter Two examines the evolving contemporary state and the changing role that policy-making plays within it. Similarly, the focus of Chapter Three is the applicability of complexity theory and fuzzy logic to existing policy frameworks. Climate change is

the focal point for the empirical research presented in Chapter Four. Here, the policy changes within the forest, agriculture, and water sectors are examined. There has been considerable debate concerning the choice of policy instruments required to achieve the ambitious greenhouse emission reduction goals set by the federal government. Climate change policy research has been focused on the benefits of voluntary measures and economic-based incentives. However, these strategies have been criticized for not fostering policy change (Galloway 2005). In response, some have advocated the continuation of a regulatory-based policy direction. This policy debate signals the importance that the state will continue to play in large-scale policy issues such as climate change.

Policy-making levels

Each of the three substantive chapters addresses key aspects of the policy process and the interaction between government agencies and societal groups. Three levels of analysis in the following three chapters relating to the policy process are examined (Table 1-1). Although political science is the disciplinary focus within each chapter, broader sociological aspects are considered. Both disciplines are examined in each chapter, eginning with the macro-level in Chapter Two, meso-level consideration of policy process frameworks in chapter three, and, finally, an empirical examination of micro-level dynamics between organizations.

Table 1-1. Approaches to policy research

Levels of analysis	Macro	Meso	Micro
Discipline			
Sociology	Political Economy	Inter-organizational analysis	Group dynamics/Social network analysis
Political Science	Neo-pluralism	Sub-government/ intergovernmental relations	Issue network

Adapted from Rhodes (1990)

Chapter Two overview

Chapter Two, *The evolving state and the staples thesis: then and now*, examines the evolving relationship between the state and staples production. Recently, the "post-staples" state argument has gained a measure of popularity for its explanation of the changing role of the state and its relationship to natural resources. I argue that the post-staples state approach provides an incomplete understanding of the contemporary competitive state. This chapter has two interrelated goals. First, it seeks to examine the emergence of a new form of state, the competitive state, resulting from regional and global asymmetries. Those advocating a post-staples state argue that the growth and influence of metropolitan cities, the destabilizing

tendencies of industrial restructuring, globalization, and the political importance of the environmental movement have restructured Canada's political economy, consequently marginalizing the importance of the natural resources. This chapter responds by arguing that predominately staples dependent regions, most notably Atlantic Canada and the prairies, require a conception of the state that reconciles the contemporary with its past. The historical evolution of the Canadian competitive state is examined and its relationship to both the staples thesis and "post-staples" state literature. This juxtaposition updates the role of the state within those economies that continue to be dominated by staples production. There are two forms of competitive states that are relevant to a discussion of staples dependence: the Schumpeterian and neo-Ricardian competitive states. The main characteristics of the Schumpeterian competitive state corresponds to those of the post-staples state. The neo-Ricardian competitive state describes the contemporary resource development that continues to flourish, if not dominate, in many parts of Canada; the competitive state approach includes stressing the importance of a comparative advantage and/or relative prices through exploiting the most abundant and cheapest factors of production. The second goal of this chapter is to make clear linkages between macro-level analyses of the competitive state by using an updated meso-level policy frameworks—more specifically policy-making process frameworks such as the policy community, policy networks, and the advocacy coalition framework (ACF). These approaches, although popular empirical applications, were developed to reflect policy-making in the KNWS.

Chapter Three overview

Chapter Three, *Navigating complex and fuzzy policy landscapes*, delves deeper into the meso-level complexities of the neo-pluralist state. There have been notable theoretical contributions by forest-oriented political scientists in the development of policy process models, such as policy networks and the advocacy coalition framework (ACF). Here, three inter-related but unanswered gaps are addressed; resulting in a methodological and empirical contribution to policy process research is made. In this chapter, four important gaps in the current policy process literature are examined. First, there is an undeveloped or incomplete conception of organizations. All require the integration of both intra and inter organizational dynamics. Second, the interaction between different policy-making levels has not been incorporated into policy process frameworks. Typically, sectoral-level policy making has been the object of investigation. A consideration of the larger policy domain and of sub-sectoral level decision making needs to be developed. Many single-field policy researchers have advocated systematic analysis, but they fail to acknowledge total political consequences. Closely related is the absence of a coherent well-developed treatment of two key political science concepts: power and state sovereignty, the third gap. The concept of power within policy-process frameworks is narrowly defined in

relation to the conflicts of different interests between competing groups. However, expressions of power and basic power relationships are often vaguely presented without elaborating upon the abilities of policy actors to manipulate other policy actors. Finally, the intrinsic vagueness and subsequent difficulties of determining causality within complex policy making systems into consideration are addressed. A reconsideration of linear-based policy process frameworks is discussed.

Responding to these four gaps is a framework that takes into consideration fuzzy logic and complexity theory. The framework developed in Chapter Three (Figure 1-1) draws upon Geyer's (2003) range of complexity dynamics model, which has been employed in order to investigate political phenomena. By borrowing complexity concepts from the natural sciences, a reconsideration of the linear-based assumptions that pervade political science research is overcome. Different types of complexity (conscious, biotic, abiotic) provide the researcher a realistic framework of political phenomena. Moreover, complexity theory helps to address the boundary problem in policy-based systems, for both the part (subsystem) can be simultaneously considered along with the entire system (Bell 2005). A significant modification to (and critique of) Geyer's (2003) framework also leads to include policy outcomes produced by causal relationships by discussing the usefulness of complexity theory and fuzzy logic for future research directions. The chapter concludes with a critical introspective of complexity theory and fuzzy logic in future research directions. Work must be done to incorporate these theoretical advances into an empirically testable approach.

Figure 1-1. The Range of complexity dynamics in physical and human phenomena

DISORDER ←				→ ORDER
Alinearity	Conscious Complexity	Biotic Complexity	Abiotic Complexity	Linearity
	Range of non-linear systems			
Examples from the natural sciences				
Aspects of quantum mechanics and light	N/A	Plant/animal interaction	Fluid dynamics and weather patterns	Gravity Motion in a vacuum
Examples from the social sciences				
Random events, dreams, the unconscious	Norms, values, language, narrative interpretation	Group dynamics, institutional processes	Crowd dynamics, electoral outcomes, economic laws	Basic Constitutional Law

(Adapted from Geyer 2003)

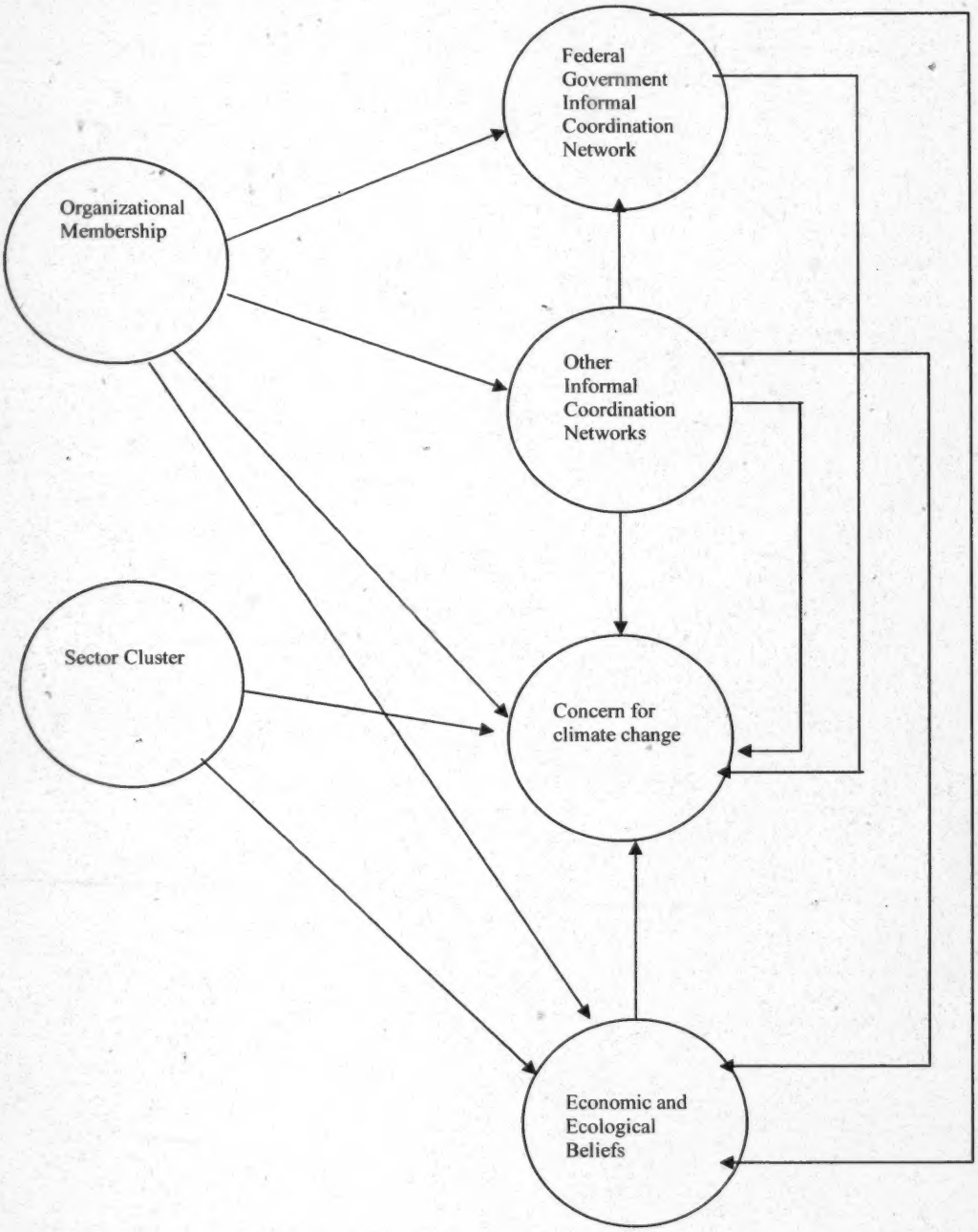
Chapter Four overview

Chapter Four, *Coordinating future climate change policies in the Canadian prairie agriculture, forestry, and water sectors*, provides an empirical examination of the relationship between concern for climate change, policy oriented beliefs, organizational memberships, and informal coordination networks among prairie agriculture, forestry, and water policy elites (Figure 1-2). Figure 1-2, which presents a heuristic model of the network model developed in Chapter Four (Figures 4-1), describes the hypothesized relationships that are both theoretically important and empirically measured. There are eight hypotheses developed in Chapter Four that discuss the relationship between membership within a particular type of organization (industry, government, environmental-research) or sector (agriculture, forestry, water) with "informal" networks, policy oriented beliefs, and a concern for climate change. In Canada, climate change has become an important national policy issue.

The Canadian federal government has responded to international scientific concerns about green house gas emissions by developing a number of significant climate change strategies. However, it is argued that future policy changes are a function of both formal initiatives as well as the interactions within informal networks of policy elites found from within government departments, industry groups, research organizations, and environmental groups. These networks serve as a useful indicator of future policy directions—particularly within a nascent policy such as climate change. An online survey of 851 prairie agriculture, forestry, and water policy elites

was conducted. The data collected from this survey was approved by the University of Alberta's Faculty of Agriculture, Forestry, and Home Economics Human Ethics Review Board. The model in Chapter Four examined the effects of broad organizational membership with the perception of other organizational clusters (as an ally), and climate change.

Figure 1-2. Conceptual framework of the structural equation model



Chapter Five overview

Chapter Five highlights the scholarly contributions made throughout the course of this dissertation and reiterates the role of *homo politicus* in natural resource-based research. The first part of the chapter considers a tangible contribution that political scientists can make in multi-disciplinary research, namely a role in integrated assessment impact frameworks and models. The remainder of the chapter highlights the contributions made within political science itself. Finally, limitations and future research directions are discussed.

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Chapter 2 - THE EVOLVING STATE AND THE STAPLES THESIS – THEN AND NOW

"The produce of the earth – all that is derived from surface by the united application of labour, machinery, and capital, is divided among three classes of the community; namely, the proprietor of the land, the owner of the stock or capital necessary of its cultivation and the labourers by whose industry is cultivated." (David Ricardo, 1817, *On the principles of political economy and taxation*, Preface)

"The wealth of those societies in which the capitalist mode of production prevails, presents itself as an immense accumulation of commodities, its unit being a single commodity. Our investigation must therefore begin with the analysis of a commodity" (Karl Marx, 1978, *Capital, Volume One*, pp. 302-303).

Introduction

Canada's relatively abundant natural resources continue to be an important thread of its cultural, economic, political, and social fabrics. Agriculture, fisheries, forestry mining, electrical energy, and oil and gas production have historically defined the Canada's image as a 'hewer of wood and a drawer of water.'[1] Over the past twenty years, new resources, such as offshore petroleum and aquaculture, have emerged and controversial issues such as possible bulk water exports to the United States have also become a subject of much debate. Ever since commercial resource exploitation began in the mid 17th century with fishing in the Gulf of St. Lawrence, trade issues have dominated policy concerns in the entire natural resource sector. They continue to do so today; only now the focus is on such matters as the restriction of live beef exports, the softwood lumber dispute, and the sale of electricity. New non-trade issues, such as climate change related impacts, the uncertainty created by large-scale First Nation's land claims, the threat of domestic resource depletion, and the popularity of producing genetically modified foods, also challenge the development and management Canada's natural resource export capacity.

This chapter examines how both the changing role of the state and its policy-making capacity in natural resource sectors have been brought into question by the recent and contemporary global spatial reorganization of capitalist economies. The state is defined as an organized political community within a defined territory containing a government that exercises sovereignty. A number of factors have been identified as influencing all natural resource sectors: new forms of state engagement, transnational organizations, globalization, subsequent trade liberalization, and international environmental group pressures. To consider the integral role that natural resource commodities play in defining the state, this chapter adopts a materialistic perspective.

This chapter has two interrelated goals. First, it seeks to examine the

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[1] This phrase is frequently used within Canadian political economy literature yet rarely cited. It is derived from the Old Testament (Josh. 9:21).

contemporary state within the context of the staples thesis. Recently, some observers have argued that the emergence of the 'post-staples' economy is the driving force behind new political and social identities. This chapter criticizes the broad assumptions adopted by these advocates of post-staples state approach. Instead, this chapter argues that dependence on natural resources remains a prevalent concern within Canadian political economy research. Whereas natural resource dependent states are faced with similar economic influences as post-staples economies, they are also dominated by natural resource path dependency characteristics that may produce different state responses.[2] One of the most pervasive factors promoting such path dependencies has been a long-standing history of state involvement in facilitating the expansion and development of staples economies. Predominately staples dependent regions, most notably Atlantic Canada and the prairies, require a conception of the state that reconciles changes in contemporary economic organization with its historical base. Furthermore, the staples thesis' re-examination will need to incorporate the contemporary state along side the forces of globalization.[3]

The second goal of this chapter is to draw clear linkages between macro-level analyses of the competitive state and meso-level policy frameworks—more specifically, organizational changes occurring within the policy-making process. Policy decisions and their implications are the state's primary output. Within this context, the 'organizational state' has been the starting point for theoretical frameworks describing policy-making process. The well developed Canadian literature describing interaction of public and private organizations in policy "communities," "networks," or "regimes" (Cashore *et al* 2000; Howlett and Ramesh 2003) is highlighted.[4] This approach adopts a strong regulatory role that is embedded within the Westphalian state. However, assumptions about policy-making and the role of public organizations may be challenged because of the competitive state's growing ascendancy over the Keynesian National Welfare State (KNWS). Meso-level governance may become responsive to global influences and institutions as well as to non-hierarchal networks of policy actors. The chapter concludes by discussing the relevance of the policy-making frameworks within the confines of the competitive state.

Chapter outline

The remaining pages provide a definition of the original staples thesis and a brief overview of the factors of production that led to the organization of different staples economies, from the height of early fisheries (mid-1700s) to contemporary industrial pulp and production. Coinciding with this economic overview is an historical evolution of state policy and a consideration of the activities relating to

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[2] Path dependency refers to a particular course of action that, once occurred may be difficult to change due to the recurring positive feedbacks within a system. See Pierson (2000) for a discussion on its applicability in the study of politics and Greener (2002) for a discussion of path dependency's role within organizations .

[3] Others, namely Cerny (1997), Dicken (1998), and Brenner (2004), have also provided commentary on the competitive state's ascendancy in a neo-liberal global economy.

[4] The term organizational state is borrowed from Lauman and Knoke (1987) who argue that policy-making in modern states is largely determined by organizations.

staples production, a discussion of parallel evolution of the forms states have taken, and the jurisdictions states have adopted on differing policy areas. Highlighted here are three major historical Westphalian state types in relation to different forms of economic organization: the colonial state, the emergent national state, and the Keynsian National Welfare State (KNWS). The nature of staples production and the associated natural resource economies have changed over the past three centuries; the sovereign territorial national state has remained a constant in natural resource development. Using a historical overview, this chapter examines recent literature purporting the demise of staples sectors and rise of the post-staples state. Later, the economic importance of staples production within Canada is revisited. Not surprisingly, natural resources continue to remain an integral part of nearly every provincial economy.

For political scientists to understand the state's response in a staple's economy, they must reconsider the state's function in light of the contemporary globalization. However, throughout Canada's economic history, the global trade issue has been dominated by commentary on metropole-periphery driven foreign trade[5]. A contemporary discussion of globalization reveals the changing spatial dimensions of economic re-organization, in particular, rescaled economies that are permeated by the supranational flow of resources, capital, information, and services but are disaggregated among regional and local economies. These changes also lead to a change in the state's role from one that controls and regulates economies to one that facilitates meditating economic rescaling. In the case of natural resources, this broad economic transformation signaled an end to a period (post World War II to 1980s) dominated by a KNWS regime and the subsequent rise of the 'competitive' state, particularly a neo-Ricardian competitive state. Although many features of this new form of state are quite familiar to Canadian economic historians such as exploiting the most abundant factors of production and an orientation towards maintaining export markets, there is still a notable difference in the composition of the state and its relationship with natural resource production. The impact of global economic integration, urban and regional resurgence, and the consolidation of new supranational and cross-border institutions have all contributed to a reconsideration of the state along with its role in staples-based economies. Similarly, another new state formation, the Schumpetarian competitive state, is introduced here. The rise of the Schumpetarian and neo-Ricardian competitive states also raises questions about governance and the role of public policy-making – namely questions about what changes to the state do to conceptions of the policy-making process and the frameworks that were previously defined by the KNWS regime.

The staples thesis and natural resource exploitation in Canada

The staples thesis is a uniquely Canadian contribution to the study of political economy. The thesis, which was first developed in the 1920s and flourished to the

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[5] Originally, the metropole-periphery trading relationship was one between France or England with its Canadian colonial territory. After Confederation, the metropole shifted to Montreal and Toronto.

1960s, describes how staples (raw or unfinished bulk commodity products, such as fur, fish, and timber) defined Canada's early economic development (primarily pre-Confederation). Economic historians, in particular W.A. Mackintosh (1923; 1953) and Harold Innis (1923; 1930; 1943), argued that during the early part of Canada's development (particularly the 18th and 19th centuries), abundant staples commodities that were easily harvested were sold to external markets without significant amounts of processing, and that market returns were dependent upon the price and income elasticities of supply and demand (Marr and Paterson 1980). There are four overlapping themes associated with the staples thesis. First, natural resource endowments that are brought into production form the backbone of the staples economy. The second consideration is autonomous demands for exports. Third, linkages from the export sector to the rest of the economy are required for economic expansion and development. Finally, technical change, in particular improvements to the transportation systems, was required in order to assist in the economic exploitation of natural resources (Watkins 1963). The Canadian experience of staples dominant economies represents a paradigm rather than a special case on its own.

A useful starting point to explain the economic history of Canadian staples exploitation is a simple production function describing the main components that make up the mechanics of economic expansion. These factors of production will later become an important consideration when developing an understanding of the original Ricardian competitive state.

$$Q = f(L, K, R) \qquad \text{(Equation 1)}$$

In this formula, Q equals the output of the final good (staple); L equals the inputs of labour; K equals the inputs of capital; and R equals the natural resource endowments. Furthermore, the Cobb-Douglas production function (Equation 2) considers the role of technology.

$$Q = TL^{\alpha} K^{1-\alpha} \qquad \text{(Equation 2)}$$

In this formula, Q, L, K are output, labour, and capital, and T and α and α-1 are the measures of the technological constants. For example, the introduction of the mechanical reaper and thrasher in the 1840s reduced per hour labour requirements per acre from 75 to 53 (Marr and Paterson 1980).

The point raised in presenting these two equations is that they capture the mix of inputs that were required for staples production and, more importantly, the evolution of staples economies and its impact on the sovereign state's response. In terms of discussing this mix, three broad staples grouping are considered. The first focuses on early staples exploitation and on the dominance of natural resource endowments as the driver of economic expansion. The development of agriculture and the growing importance of labour inputs are then discussed. This discussion is followed by a review of capital-intensive staples industries, such as mining, hydro-electricity, and forestry (in particular pulp and paper). Whereas all three inputs and the evolution of technology were present in all three examples of the economic

organization of staples production, one input tended to influence the state's response.

Natural endowments, early staples, and colonial expansion

Early staples exploitation was largely successful because of to the large natural resource endowments (R) in comparison to the relatively small amount of investment required in labour and capital. Fish, fur, and timber were harvested from vast common resource pools. The east-coast fisheries were the first staple to be exploited. English and French vessels began fishing (primarily for cod) off Newfoundland's banks in the late 16th century (Innis 1940). Cod was spilt, dried, preserved in salt, and shipped to export markets. The French fisheries sold mainly to their domestic market whereas the English-based operations exported cod to Spain and Portugal, largely in return for sherry and silver (Marr and Paterson 1980). Although the Atlantic fishery was eclipsed by the fur trade in the 18th century, fishing remained integral to Atlantic Canada's economy well before Confederation (Easterbrook and Aitken 1956). A number of linkages with fishing - wooden-ship building, shipping, and the timber and lumber industries - were made. The development of new technology for preserving food made it possible for the addition of new enterprises, such as those specializing in the production of canned herring and lobster. In the late 19th century, improvements in transportation, combined with the growth of large industrial cities in the interior of North America, created new markets for fresh fish. The fur trade also relied on large natural resource endowments throughout Canada's vast hinterlands. By the late 18th century, two English trading companies, Hudson's Bay Company and the North West Company, dominated fur trapping. Because of the persistent need to explore new hunting areas, the fur trade was primarily responsible for geographic expansion (Innis 1930).

In many regions, however, the fur trade was quickly replaced by timber exploitation. By 1820, Canadian timber dominated the British market (81% of its timber imports) (Marr and Paterson 1980). There was a demand by shipbuilders (in England) for rough-hewn Canadian lumber, especially for the construction of masts. The sudden rise in demand was attributed to the high tariffs placed on Baltic timber (Britain's traditional timber trading partner) and the unavailability of timber from United States (Easterbrook and Aitken 1956). Timber harvesting, which began along the St. Lawrence River, then spread to the Ottawa River (logs could be transported on the river). Considerable timber development took place along the St. John River in New Brunswick. Because the timber ships provided cheap transport to British North America for immigrants on the otherwise empty westward journey, they facilitated a surge in migration between 1830 and 1840, that contributed to the first wave of agricultural settlement in Upper and Lower Canada (Easterbrook and Aitken 1956).

Agricultural development and the wheat economy

Within the staples thesis literature, the rise of the agricultural economy is considered to be the key to Canada's widespread economic, social, and political development (Folke 1946; Easterbrook and Aitken 1956). There are two notable stages that mark Canadian agricultural expansion. The first occurred in central Canada whereas the second marked the rise of the prairie wheat economy. In some regions, particularly in Lower Canada, the establishment of agriculture in the early 1600s overlapped the fish, fur, and timber staples. However, commercial agriculture came to prominence in Upper Canada and Lower Canada in 1830s. Favourable export conditions, which were largely attributable to the Corn Laws, increased Britain's demand for Canadian grain and flour. As a result, the population, attracted to freehold land, grew correspondingly. For example, Upper Canada's population increased from 150,000 in 1824 to 487,000 by 1846 (Marr and Paterson 1980, p.103).

With the transnational railway's construction, the prairie agriculture economy expanded in the early part of the 20th century, marking the second stage of agricultural growth. In 1891, there were 6,312,000 acres of occupied land; by 1916, there were 73,300,000 acres of occupied land by a growing number of homesteaders (Marr and Paterson 1980, p.346). This dramatic increase in the number of homesteads corresponds to the prairie's population growth: Manitoba's population increased from 152,506 to 461,394 between 1891 and 1911; Saskatchewan's grew from 91,279 to 492,432 between 1901 and 1911; and Alberta's grew from 73,022 in 1901 to 374,295 in 1911 (Innis 1943). The total area of prairie land, which was available as free or inexpensive holdings grew from 5.9% in 1881 to 52.9% in 1911.[6]

According to the Cobb-Douglas equation, there were large tracts of land available for agricultural settlement (R) in both central Canada and on the prairies. However, the output of agricultural staple production still relied heavily on labour input (L), despite the advances in technological advances occurring over the course of the 19th and early 20th century. By 1891, nearly half (45.8%) of the Canadian population in the labour force was engaged in agricultural production (Denton 1983).[7]

Capital intensive staples and the rise of the new industrialism

The third type of staples growth, derived from capital inputs (K), began to emerge particularly after World War I.[8] Machines replaced wind, water, and animals as the primary source of power (Easterbrook and Aitken 1956). The growth of manufacturing –both domestic based and foreign – as well as the industrialization of Canada led to the demand for new staples, and redefined the mix of factors for their output. Manufacturing industries required coal and hydro-electricity; petroleum and natural gas oil fields required for power. Moreover, previously underutilized inputs, such as aluminum, coal, and iron ore, became sought after resources, leading to the

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[6] By 1971, this rate was 78.7% and by 2001, 81.4% (Trant 1983) (Azmier and Stone 2003).

[7] By 1971, this rate was 5.6% (Denton 1983).

[8] The time periods when the new industrialism and the rise of agricultural economy, particularly the wheat economy, occurred overlapped. Nonetheless, they represent different modes of production.

dramatic increase in their extraction. This extraction (or harnessing in the case of hydro-electric power) required large capital investments and changes in technology. Changes in technology, such as new exploration techniques, geophysical surveying, and improved transportation, helped Canada's iron ore sector. Forestry continued to dominate Canada's export market, particularly after World War I. In fact, between 1918 and 1922, pulpwood production quadrupled and there were over 300 pulp mills established throughout Canada (Lower 1938; MacKay 1985). Production increased from 1,960,402 tons in 1920 to 9,077,063 tons in 1953; likewise the capitalization of industry increased reflected by a decrease in the number of pulp mills (130 by 1954) (Easterbrook and Aitken 1956, p.211).

This period marks a turning point wherein the emergence of new industrial-oriented staples extraction and production no longer dominated the entire national economy of a country; instead, natural resources became one of many in a multiple sector economy. Notwithstanding this transformation, individual staples production continued to dominate many provincial economies: forestry in British Columbia and New Brunswick; oil and gas in Alberta; wheat in Saskatchewan; and fishing in Newfoundland.

The evolving state and staples production

The social and functional organization of the different economies based on staples commodities (previously described) has also played a contributing role in defining the evolution of the Canadian state. Four generalized forms of state can be identified in relation to staples production (Table 2-2): the colonial and emergent Westphalian state, the emergent-organizational state, the Keynesian National Welfare State (KNWS), and the competitive state. This section discusses the first three state types, capturing the broad parameters of their evolution by illustrating the changing relationship between the state and staples production. Table 2-2 highlights the importance of the role organizations play in defining the state. Through its evolution, the state is defined by its organizational characteristics (Laumann and Knoke 1987). Moreover, the role that these organizations play becomes increasingly important within the policy-making process literature.

Table 2-1 Historical evolution of the state in response to Canadian economic organization

Type	Colonial and emergent Westphalian State		Emergent organizational State	Keynesian National Welfare State (and crisis)	Competitive states
	Interventionist-Mercantilist State	UK Ricardian State – early Canadian State			
Time period	1600s-1840s	1840s-1900	1900-1945	1946-1970s 1970s-1990s	1990s-present
Characteristics	Colonial control mercantilist expansion Trading preference for colonial goods.	Free trade Industrialization Responsible government National Policy	Core-periphery relationships, industrialization, staples traps, rise of protest movements; Key path dependencies are developed	U.S. Branch economy, regional economic development policies, state expansion and then retreat, Federalism	Globalization and re-scaling, environmental protest movements, Schumpeterian and neo-Ricardian states
Organizations	Few – mainly companies	Few – mainly companies	Rise in government agencies and pressure organizations	Organizational State	Organizational state Transnational organizations
Coordination	Market-hierarchal	Market-hierarchal	Hierarchal-market Early policy communities	Hierarchal, Regulatory Policy communities	Hierarchal-Network, Non-state governance
Dominant staples	Fur, Fish, Forestry (timber), Agriculture	Forestry, Agriculture	Multiple Agriculture, Forestry (pulp and paper), Mining	Multiple - Oil and Gas	Multiple Water exports

Colonial and emergent Westphalian states

Colonial and emergent Westphalian states best describe the formation and the states response to staples development prior to the 20th century. There are two very distinct periods marking the shift from colonial government to the early forms of responsible government in British North America (Upper Canada, Lower Canada, New Brunswick, Nova Scotia, and Prince Edward Island) in Table 2-1: mercantilism and the original Ricardian competitive state.

State involvement under mercantilism involved promoting the expansion of the staples economy across the fledging North American continent (as was the case in other colonies elsewhere outside of Europe). The colonial state (Britain or France) facilitated resource development and territorial expansion of early staples such as fish, fur, and timber, the colonial state, which in turn promoted mercantilist interests. For example, the Hudson's Bay Company was incorporated in 1670 as the result of a Royal Charter from King Charles II. The Charter gave the Hudson's Bay Company a monopoly over fur trade in a region covering 1.5 million square miles (Innis 1930; Marr and Paterson 1980). The British Corn Laws (1794-1846) are another example of colonial protection afforded to Canadian colonial farmers. Agricultural exports, primarily grain and flour from Canada, were largely exempt from the high tariffs imposed by Britain on all other countries. The long standing debate over the Corn Laws would continue to affect Canada's staple economy and the development of the state.

In 1846, British Prime Minister Robert Peel announced the repeal of the Corn Laws, ushering in a new era of free trade. The repeal marked a watershed in colonial trade relations and the Canadian state. The same period was marked by rapid British industrialization. Industrial interests, in particular the Manchester Anti-Corn Law league, supported free trade and the concept of comparative advantage (Wallace 1948a). Economist David Ricardo, an MP and the author of *Essay on the influence of a low price of corn on the profits of stock* (1815), was a leading political figure supporting free trade and repealing the Corn Laws (Wallace 1948b). From him was born the term "Ricardian" state. Industrial growth in Britain was matched by the growing financial burden of the colonial trading system (Colquhoun 1948). As a result, the British government began to divest itself of its colonial responsibilities, an approach that led to the acceleration of responsible government in those colonies.[9] Peel declared that it "is desirable that we should act on the principle of treating Canada as if it were an integral part of the Empire" (Colquhoun 1948, p.132). The five provincial colonial governments responded by attempting to improve trade relations with the U.S.: the results were 1854 Reciprocity Treaty and the Galt tariff that placed duties on British manufactures.

The debate between free traders and protectionists continued into

[9] By 1848 the province of Canada and the province of Nova Scotia had achieved responsible government.

Confederation. However, the National Policy, adopted in 1879, signaled the protection of Canadian industries with high tariffs. The National Policy also continued the trend of state sponsored economic intervention, particularly the development of infrastructure required for transportation and production. One of the most famous examples of government promotion of the staples economy was the construction of the transcontinental railway, which was partially funded by government subsidies and bonds. The railway's construction was part of the MacDonald-Laurier National Policy that sought to encourage settlement in the agriculture sector in western Canada. However, this policy also promoted an unequal relationship between the central Canadian heartland and the western hinterland. The main features of this relationship were the following: confining the hinterland to producing of a small number of staples; the hinterland required to purchase manufactured products from the heartland, and capital development originated within the heartland (Smiley 1975).[10]

During this early period, the state's scope within the different staples sectors was minimal. Minimal implies an important distinction between the state's interventionist policies concerning staple development, as discussed above, and its subsequent policy-making capacity within each of the staples sectors. Endogenous policy development within the early staple sectors was largely non-existent. Decisions within a particular sector were largely made by private actors and were business oriented. In *The fur trade in Canada: An introduction to Canadian economic history*, (1930) Innis stated that the administration of the early fur industry revolved around the interaction of two large mercantilist companies and their officials, namely the Northwest and the Hudson's Bay Companies, with the early traders. He notes that "[I]t was significant, however, that business organization was of vital importance [to the development of Canada's fur trade]" (Innis 1930, p. 258).

Similarly, in the forest sector, the Department of the Interior's Dominion Forestry Branch, the first regulatory body, was established in 1899.[11] However, unregulated timber harvesting had been underway for nearly a century. In eastern Canada, concern over the depletion of forested lands precipitated calls for timber regulations (Ontario 1893). The Forestry Branch was charged with the monumental task of the "protection of standing forests on Dominion lands" (Canada 1918). In western Canada, the Forestry Branch reported that in 1918 it employed 562 , but only 44 of these were "technically trained foresters" (Canada 1918, p.99). The Branch also highlighted the challenges of forest administration.

> In the early stages, forest matters were dealt with by the officials of the Department of Lands. The work centred chiefly in Vancouver, at the office of the timbers inspectors. A forest ranger with a launch patrolled the 700 miles of coast-line between Vancouver and Prince Rupert. The forests of the

[10] The construction of the transnational railway is the best-known example of the state's involvement in the early staple's economy. Other examples included the 1842-1848 constructions of the St. Lawrence and Welland canals and the King's Highway in Southern Ontario (1763-1850). Government intervention, while promoting the expansion of early staples economies, marked the starting point of 'mega-project mentality' by the Canadian state (Brooks 1989).

[11] The Branch was the precursor of today's Canadian Forest Service

> interior country were administered by collectors, who paid occasional visits in quest of royalty due from operators who had cut Crown timber. In those days, even though logging operations were conducted on a small scale, this slender staff was unable to cope with the situation effectively (Canada 1918, p.115).

Prior to World War I, state involvement and bureaucratic capacity in the regulation of forest management (at both the federal and provincial levels) was very limited. However, an emerging cadre of forest professionals raised their concerns about the depletion of forests at the 1906 Canadian Forest Convention in Montreal and again at the 1909 North America Conservation Conference (Burton 1972). Their concerns eventually led to state resources being dedicated to the enhancement of forestry departments and the onset of regulatory regimes.

The emergent organizational state and industrial expansion of natural resource sectors

The Colonial and Emergent Westphalian State contrasts with the organizational industrialized state (1900-1945) and the subsequent growth of a "new generation of staples," particularly the expansion of prairie-based agriculture during a period that Nelles (1974) labels the 'new industrialism.' The staples economy became more dependent upon labour and then later, capital-intensive factors of production for staples production. One of the driving factors behind economic growth was the booming population resulting from the federal government's immigration policy (Morton 1938). Canada's net migration increased in the 1901-11, 1911-21, and 1921-31 periods by 716,000, 232,000, and 229,000, respectively (Marr and Paterson 1980). As discussed earlier, the influx of immigrants is largely attributed to the prairie wheat boom. Accompanying the demographic and economic expansion of the agriculture sector was organized political activity by farmers protesting the mercantilist core-periphery relationship. This uneven relationship was built on the extraction of staples and their transportation to the centre for processing. Periphery-based producers then purchased capital and manufactured goods from the centre. This unequal relationship was captured in Seymor Lipset's (1950) *Agrarian Socialism* and C. B. McPherson's (1953) *Democracy in Alberta*. Both of these seminal works chronicled the rise of prairie political protest movements in the early part of the 20th century. Agricultural cooperative movements and various prairie agricultural organizations, such as the Manitoba Grain Growers' Association and the Alberta Farmers' Association (some of which continue be in operation today) rose to prominence. Struggles by farmers to form agriculture cooperatives underlie the longstanding history of the political and policy interaction between farmer-based organizations and the state. Organizational activity on the prairies forced institutions to develop early agricultural policies. This organizational growth was chronicled in Fowke's (1946;1957) narratives of farmer-based cooperatives and their relationship

with the state. The role of producer-based groups continues to dominate current agricultural policy making (Skogstad 1987).

Whereas the issue of producer-controlled marketing and commodity prices dominated the early 20th century agriculture sector, conservation came to the forefront of the burgeoning industrialized capital-intensive Canadian forest sector. In response to the sector's economic growth, the 1924 Royal Commission on Pulpwood found that many tracts of lands in the western provinces had been cut over (Howlett 2001a). The push for conservation-oriented policies was a predominant concern among civil servants within the Dominion Forest Branch (Gillis and Roach 1986). This matter also resonated within newly formed prairie provincial forestry departments that were established as a result of the 1930 *Natural Resources Transfer Agreement* which transferred the ownership of resource rights from the Dominion government to the provinces. The prominence of provincial forestry responsibilities and the concern over the long-term, sustained timber yields signaled the beginning of extensive state involvement throughout the Canadian forest sector.

A growing population and/or the rapid industrialization of staple-based economies characterized the development of the organizational state. Individual staples continued to dominate many provincial economies. However, these sectors experienced considerable technological advances that led to an accelerated industrialization. Industrialization led to the formation of organizational interests and the establishment of state-based bureaucracies that sought to address the problems associated with modern capitalism. And with such bureaucratic growth emerged interest/interest groups, whose political ambitions were focused on these bureaucracies.

A notable aspect of this period was the path dependencies created by a number of institutional and structural outcomes and developments; they in fact, continue to influence natural resources sectors today. Path dependencies over a period of time are not determined by any particular set of initial conditions (Pierson 2000). Rather, a system that exhibits path dependency is one "in which the outcomes are related stochastically to initial conditions, and the particular outcome that obtains in any given run of the system depends on the choice or outcomes of intermediate events between the initial event and the outcome" (Goldstone 1998, p.835). The embeddedness of state involvement, which began in the early staples period, became integral to the growing number of stables based sectors that drove Canada economic growth. In forestry, for example, the initial event, namely the transfer of forested Crown lands to provincial governments, eventually led to the creation of large-scale industrial tenure arrangements. Regardless of a state's development, path dependencies exhibited across all natural sectors still continue to shape the state's response particularly in its institutional arrangements.

Keynesian National Welfare State: A legacy of persistent underdevelopment

The growth of the large-scale regulatory bureaucratic state was one of the lasting legacies of the Keynesian National Welfare State (KNWS). There is ample scholarly analysis and debate about the KNWS and its subsequent crisis (See Crozier *et al.* 1975; Gough 1979; Offe 1984; Esping-Andersen 1990 for extensive reviews). During this period (1946 to 1990), the staples thesis no longer captured academic interest, due to its inability to account for Canada's post-war economic growth particularly that of the manufacturing sector in what constituted the "periphery." Traditionally, the state was defined in terms of the classic core-periphery relationship. However, during the KNWS period, the relationship between the core and the periphery changed. The periphery retained and attempted to foster industrial growth; however, economic activity within the periphery was no longer linked to the domestic centres for its financial and other services, nor was it linked directly to staples (Krugman 1991). Between 1940 and 1994, the percentage of Canadian exports to the U.S. increased from 41.1% to 81.4% (Krugman 1991). However, the growth in exports (both in total dollar value and a percentage of exports) was of manufactured goods. This period also marked the beginning of the debate regarding the emergence of Canada's "branch plant" economy and the role of foreign, primarily American, capital (Levitt 1970; Watkins 1970).[12] Despite Canada's post-war industrial expansion, its economy remained underdeveloped in comparison with other industrialized countries.[13] This underdevelopment was in part the result of industrialization policies that successive governments pursued, which emphasized the protection of domestically produced goods for which a domestic market, served or threatened by imports, already existed (this policy is referred to as import substitution industrialization) (Brooks 1989). The KNWS state organization promoted a macroeconomic strategy of mass consumption and growth, high employment, and the evolution of a myriad of social safety programs (Gough 1979).

No discussion of the Canadian KNWS would be complete without a discussion of the changing face of federalism. Beginning in the 1960s and 1970s, provincial governments became increasingly more powerful, developing strategies and ambitions of their own (Pratt 1977; Cairns 1977). This change not only result from the role of Quebec and the "French factor" but also resulted from the extensive jurisdiction that provincial governments have over natural resources (Hueglin 1987). One of the most prevalent outcomes of the federalism within the Canadian KNWS was 'province building' and the emergence of powerful provincial administrations that sought to manage their growing resources. Thus, within the KNWS, powerful, parallel sub-national welfare states emerged (Black and Cairns 1966; Chandler and Chandler 1982).

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[12] Branch plant economy is a term that refers to the a trade policy, implemented in order to give preference to Canadian-made manufactured goods over imported goods to build Canada's industrial base. A tariff system increased the cost of imported finished goods, rendering them less competitive in the Canadian market. However, the unintended result of the high-tariff policy was to encourage foreign capital to avoid the tariff barrier by setting up manufacturing "branch plants" in Canada to serve the small domestic Canadian market.

[13] Brooks (1989) refers to Canada as 'most developed underdeveloped country.'pg. 89.

Staples dependence carried on over a long period of time leads to well established investment and market patterns (path dependencies) that are difficult to change (Marchak 1983). This situation is known as the "staples trap." Despite the problems associated with industrialization generally and the relative degree of staples dependence encountered, provincial and federal governments made concerted efforts during the KNWS period to overcome the staples trap where it occurred. In some cases, regional decision-makers can become 'addicted' to resource extraction with little opportunity to escape (Freudenberg 1992). For example, Marchak's analysis of British Columbia's declining forest economy and its impact upon labour and forest dependent communities in *Green gold* (1983) chronicled the role that the provincial state played in cooperating with and facilitating international capital through its various policies that were intended, but ultimately failed, to create backward, forward, and parallel linkages.

National and provincial governments during the KNWS period pursued three notable strategies in responding to the staples trap. The first strategy is to do nothing – an approach leading to resource exhaustion and permanent underdevelopment. Such a strategy was undertaken in Atlantic Canada, leading to the exhaustion of its key staples, such as the fisheries and coal, and the subsequent decline of its overall economy (OECD 2002). The second strategy involves promoting a new or existing staples base. Macallister and Alexander (1997) detail the subsidization throughout the mining industry, such as a national flow-through share program that allows a company a 100% tax deduction for the cost of eligible exploration expenses. Urquhart and Pratt's (1994) investigation of Alberta's forest sector suggests that this second strategy was implemented by the provincial government as part of a natural resource expansion plan. The forest sector was expanded by generous government land tenure arrangements and by favourable loans to multinational forestry corporations, which encouraged them to build mills in the vast, largely unexploited, boreal forest area. The third and most prevalent strategy during the KNWS period was that of diversification in resource-dependent regions. This strategy has, for a number of decades, been an ongoing policy direction of both the federal and provincial governments. For example, the Pearson government established the Department of Regional Economic Expansion (DREE) and, in 1982, the Department of Regional Industrial Expansion (DRIE). Regional development initiatives continued well into the mid 1980s (Savoie 1984). By then, the Mulroney Conservative government began to gradually reduce the level of industrial incentives and began to promote knowledge based industries (Doern and Phidd 1992). Federal agencies, such as the Atlantic Canada Opportunities Agency (ACOA) and Western Economic Diversification (WED), remained in place in order to tap into "insufficiently exploited local competitive advantages" but were a shadow of previous attempts to enhance regional development (OECD 2002). The Federal government's broad policy shift emphasizing the knowledge-based economy marks

the beginning of a gradual shift to the competitive state.

The rapid growth of the KNWS state and, in particular, of province building, with its focus on regulatory regimes, led to scholarship that sought to understand governance through the lens of many specialized functions. The state became conceptualized as a collection of 'policy communities' that contained governmental and societal-based organizations oriented towards particular sectors—including natural resources.[14] A policy community is the structural configuration of the actors who participate in the policy process within a particular sector (Pross 1986) (see Figure 2-1 below). More specifically, Coleman and Skogstad (1990) describe a policy community as including "all actors or potential actors with a direct or indirect interest in a policy area or function who share a common 'policy focus,' and who, with varying degrees of influence, shape policy outcomes over the long run" (p.25).

A given policy community consists of two segments: the "sub-government" and the "attentive public." The sub-government is at the centre of any policy community. It includes senior government personnel in positions of direct responsibility for a particular policy sector and members of nongovernmental organizations, such as producer groups, who have become established day-to-day participants in policy formulation and implementation. The attentive public consists of actors who are capable of influencing policy, but who do not participate in policy-making on a regular basis. This group might include pressure groups, professional organizations, other government departments, and international organizations and governments. Although the concept of a policy community is used to identify and classify the actors involved in the policy process, the concept of a policy network has been used to describe relationships between and among governmental and nongovernmental actors (Lindquist 1992). This approach has spawned a large body of literature describing a variety of government–organization relationships based on such factors as resources, degree of institutionalization, and rules of conduct (Coleman and Skogstad 1990; Lindquist 1992; van Waarden 1992; Howlett and Rayner 1995). Similarly, the policy regime approach (see Cashore 2000 *et. al*) and advocacy coalition framework (see Sabatier and Jenkins-Smith 1993) were devised in an attempt to characterize the policy-making process within the KNWS.

The post-staples economy – Whither the role of staples?

In his analysis of British Columbia's changing economy, Hutton argues that the "rapid growth and hegemony of metropolitan cities, new rounds of industrial restructuring and attendant opportunities and destabilizing tendencies, processes of globalization and transnationalism, the environmental movement and its nascent political affiliates, and redefining shifts in the nature of political discourse and policy practices" are strategic to the restructuring of 21st century Canada's "social identity and political economy" (2005, p.25). More specifically, changes resulting from substantial natural resource depletion, increasingly capital and technological intensive

[14] A regulatory regime refers to a historically specific configuration of policies and institutions which establishes certain broad goals that transcend the problems of the problems specific to particular industries (Howlett 2001, p.5)

resource extraction from lower-cost staple regions, and the transition from pure extraction to increased refining and secondary processing of resource commodities have been responsible for a shift in sectoral dominance from a natural resource based economy to a service-based economy, particularly in British Columbia. Gunter (1997) and Hayter (2000) have made similar observations, focusing specifically on the post-staples evolution of British Columbia's forest economy. Hutton (2005) also stresses the importance of city-regions driving the subordination of resource extraction over the past several decades.[15]

The post-staples economy argument - that Canada's natural resources are of relatively minor importance when compared with the rest of its economy - is reflected in the data provided in Table 2-2. Less than seven percent of Canada's workforce is employed in natural resource sectors; thus they contribute to less than thirteen percent of national GDP, despite the fact that Canadian exports of resources more than doubled between 1990-2001, growing from $72.0 billion to $167.5 billion or at an annual rate of growth of just under eight percent for the period (Department of Foreign Affairs and International Trade 2003). However, this resource-based growth rate was less than the 10.7% average annual rate recorded by non-resource exports, which increased from $76.9 billion to $234.8 billion (Department of Foreign Affairs and International Trade 2003).

Table 2-2. Economic indicators for Canada's natural resource sectors

Year (2002)	Forestry	Minerals	Energy	Total Natural Resources	Canada
Gross Domestic Product ($ billions)	$29.9 (2.8%)	$38.1 (3.6%)	$65.3 (6.2%)	$133.3 (12.7%)	$1 050.9 (100%)
Direct employment (thousands of people)	361 (2.3%)	355 (2.3%)	225 (1.5%)	941 (6.1%)	15 411 (100%)
New capital investments ($ billions)	$2.7 (1.3%)	$4.5 (2.2%)	$38.2 (18.6%)	$45.4 (22.1%)	$205.3 (100%)
Trade ($ billions)					
o Domestic Exports (excluding re-exports)	$43.1 (11.8%)	$47.7 (13.1%)	$49.7 (13.6%)	$140.5 (38.5%)	$365.1 (100%)
o Imports	$10.5 (3.0%)	$47.2 (13.5%)	$17.3 (5.0%)	$75.0 (21.5%)	$348.4 (100%)
o Balance of trade (including re-exports)	+$32.6	+$1.9	+$33.2	+$67.7	+$47.9

Source: Natural Resources Canada. 2003, p.1.

[15] Brenner (2004) provides a detailed overview of urban transformation and the role that city centres, as well as new emerging urban spatial formations play in defining region, national, and, in some cases, international economies.

These economic changes suggest that a new conception of the state – the post-staples state – should be adopted. The arguments for a post-staples state are, in part, describing a symptom of the KNWS's declining influence in Canada. This new state formation, Hutton (2005) argues, is a response to the power of city-regions, the emergence of a transnational urban society, global processes of economic growth and change, the social 'inculcation' of environmental values, and changing state policy priorities and discourses. These forces are important considerations in any conception of the state. However, the complexities associated with globalization and subsequent changes to the evolution of modern capitalist states render a multiplicity of state-types possible. In addition to the 'post-staples' state, this chapter argues that another particularly relevant state formation requires consideration – the competitive neo-Ricardian state, in particular, its sub-national form (provincial). This state facilitates staples development of fixed natural resource endowments exclusive to their own territorial spaces.

Contemporary staples production and the competitive state

Continued importance of staples production in Canada

Despite the historical changes in the state reviewed here, the economic importance of natural resources persists in all but two of Canada's provinces and territories.

Table 2-3. The role of resources in provincial exports: 1997-2001 averages

	Revealed comparative advantage	Export dependency
British Columbia	1.87	75.87
Alberta	1.97	79.95
Saskatchewan	2.19	88.56
Manitoba	1.42	57.41
Ontario	0.46	18.60
Quebec	0.99	39.99
New Brunswick	2.24	90.60
Nova Scotia	1.59	64.30
Prince Edward Island	1.94	78.76
Newfoundland & Labrador	2.38	96.48
Yukon	2.13	86.20
Northwest Territories	2.45	99.08
Nunavut	2.46	99.64

Source: Department of Foreign Affairs and International Trade 2003, p.13

Table 2-3 demonstrates a continued dependence upon the natural resources sector in the economies of eleven provinces and territories. There are two sets of statistics presented in Table 2-3. The first statistic, revealed comparative advantage measure, shows the ratio of the provincial share in resources trade to the national share of resources in total trade. If this statistic is greater than 1.0, the province trades relatively more in natural resources than does Canada as a whole. Conversely, if the ratio is less than 1.0, resources are less important in provincial trade than they are nationally. The second measure is a dependency ratio that shows the share of natural resources in total provincial trade. This statistic indicates that trade in resources accounts for a certain percentage of total provincial trade. Compared with the rest of Canada, Ontario, in particular, presented a low revealed comparative advantage score (0.46) and had an export dependency score less than 20%. High revealed comparative advantage and export dependencies were evident in nearly all other provinces and territories. In the case of the prairie provinces, both Alberta and Saskatchewan are highly dependent upon natural resource sectors. However, their sources of dependency are different. The oil and gas industry dominates Alberta's natural resource sector, whereas agriculture is the leading sector in Saskatchewan. Manitoba, on the other hand, has a comparatively diversified economy and a diversified natural resource sector. Although Manitoba is still dependent on natural

resources, their economy includes strengths in agriculture, forestry, mining, and hydro power. Furthermore, Winnipeg is a crucial transportation hub. As a consequence, transportation, an indirect but important staple related service sector, plays an important role in Manitoba's economy (making up 4.7% of GDP and 20% of foreign-based commodity exports) (Manitoba 2004). The most surprising results are those for British Columbia, which has revealed high comparative advantage (1.87) and export dependency (75.87) scores. However, as argued earlier, that province's transformation to a post-staples economy should have led to lower scores.

Globalization and spatial considerations of the state

The previous sections chronicled the changing staple economies (early staples, agricultural expansion, and new industrialism) and the evolution of three broad state types (colonial and emergent Westphalian, emergent-organizational, and the KNWS-regulatory) that responded to the different modes of economic production. These three state formations were based on the assumption that national and (in the case of the Canadian provinces) sub-national territories were 'containers' of economic, political, social, and cultural power (Jessop 2004). However, there is a popular view that the organization of territorially defined economies and state roles is being eclipsed by the forces of globalization. There has been a proliferation of literature dedicated to globalization studies and its impacts on all aspects of economic, political, and social life. Brenner (2004) argues that studies examining the role of the state within a globalizing economy often present a bleak picture of the state's relevance, for its sovereignty and effectiveness has been eroded by supranational flows of capital (e.g., the global integration of markets, formation of supranational trading blocs, intensified foreign direct investment) and organizations not bound by territory (World Trade Organization, Group of Eight, North American Free Trade Agreement, World Bank, International Monetary Fund). However, Brenner (2004) presents an alternative conception of the state in the face of globalization which overcomes what he calls the "epistemology of state-centrism." State centrism situates state "within self-enclosed, contiguous, and mutually exclusive territorial spaces" leading to "the unhelpful polarization of positions between proponents of the view that national states remain fully sovereign territorial power-containers and those who contend that the state regulatory capacities are being eroded" (Brenner 2004, p.70). Both the economic organization of contemporary capitalism and "post-Westphalian landscapes of statehood" require a reconceptualization of space and scale. Brenner (1999) refers to this concept as involving a dialectical interplay between 'deterritorialization' (the erosion of the sovereign state) and 'reterritorialization' (new configurations of territory based on sub-national and supra-national scales from which the state functions). Thus, there is "a significant functional, institutional, and geographical reorganization of statehood at a range of spatial scales" in which the state's regulatory functions are being downplayed at the same time as the state must facilitate multiple

layers of rescaled economies through such mechanisms as the promotion of public-private partnerships, the creation of quasi-non governmental organizations (QUANGOs), and the enhanced role given to local-level governments (Brenner 2004, p.70).

Changes to the national state's function may lead to intensifying the role placed on both sub-national and supra-national forms of territorial governance. In particular, provincial governments may continue to play a leading, albeit different, role facilitating the natural resource development within globalized markets. There are two factors that indicate the provincial state's continued importance in staples economies. First, "self-enclosed, contiguous, and mutually exclusive territorial spaces" continue to remain important for natural resource dependent states because of the fixed feature (recalling R in Equation 1) of all natural resource endowments that fall within their boundaries. This feature requires continued interaction (more specifically negotiation) between the state and globally organized industries based on resource extraction. Unlike the manufacturing industries, where capital is highly mobile and will seek out low-cost labour, natural resources endowments are located within a specific region. Furthermore, with the exception of agriculture, provincial governments own the natural resources within their set boundaries. Secondly, the long history of state involvement in promoting natural resource expansion and development should not be overlooked. Provincial governments, for example, provide investment for research and development and for necessary infrastructure investment such as transportation facilities.

Globalization and competitive states

The rescaled state also takes on the role of a competitive state. The overarching theme stressed in discussions of the shift from the Keynesian National Welfare State (KNWS) to the competitive state is that accumulation strategies have stimulated new spatio-temporal fixes. Therefore, economic competition and organization began to extend significantly beyond national-state boundaries. One of the competitive state's primary roles is facilitating the profitable economic activities by private capital as well as securing the "overall economic and social reproduction of the labour force" (Jessop 2004, p.2). Another feature of the competitive state is the geographic units of competition, which are cities, regions, and trading blocs more than national economies. Finally, a "hollowing out" of the state has led to new forms of governance (liberal, corporatist, statist, and heterarchic or self-organizing), the emergence of "workfare" as an alternative to welfare, the redrawing of the boundary between private and public, and the de- and reterritorialization of a wide range of interests and identities (Jessop 2002a).[16]

There are two forms of competitive states relevant to a discussion of the Canadian staples production and the state: the Schumpeterian form and the neo-Ricardian form. The main characteristics of the Schumpetarian competitive state, as

[16] The term hollowing out largely refers the privatization and private delivery by third parties of what were previously government programs.

well as its historical development, closely correspond to what Hutton calls a post-staples state. The Schumpetarian competitive state is the focus of Jessop's (2002) book, *The future of the capitalist state*. The Ricardian competitive state receives only a passing reference (one paragraph).[17] However, the Ricardian state's characteristics lead to the argument that this form best describes the kind of policy regime continuing to flourish throughout many parts of Canada with regard to resource sectors. These two concepts of the competitive state and its relation to the Canadian staples context are described below.

Jessop (2002a) argues that since the early 1970s, the KNWS has been destabilized by crisis and been in decline. The Schumpeterian state has, he claims, taken its place. The orientation of the 'generalized' Shumpetearian competition state is centred on a "the concern with innovation, competitiveness and entrepreneurship tied to long waves of growth and pressures for perpetual innovation" (Jessop 2002a). Such a state facilitates the prevalent trend in nearly all advanced capitalist economies - the transformation from an industrial to a knowledge-based economy (Torfing 1999).

Some of the main characteristics of the Schumpeterian competition state include the following: changing regulatory frameworks to facilitate market flexibility and moblility, the liberalization and deregulation of foreign exchange (that will facilitate the internationalization and acceleration of capital flows), modifying institutional frameworks for international trade (the harmonization of technological, economic, juridicopolitical, sociocultural and environmental issues), promoting national-level industries and their 'global spread', and engaging in place-based competition in an attempt to fix mobile capital within the state's own economic spaces, therefore enhancing interurban, interregional, or international competitiveness (Jessop 2002a, p.148). Hutton (2005) also discusses the growing importance of Canadian-city regions as the leading agency of economic growth, political power, and the shift away from a policy emphasis on resource development. Whereas Jessop dedicates most of his discussion to the Schumpetarian competition state, he does highlight other forms of competition that result in new state typologies. The competitive state most directly linked to staples production is the neo-Ricardian competitive state.

The neo-Ricardian competitive state stresses the importance of comparative advantage and/or relative prices, particularly how this advantage relates to natural resources (Jessop 2002a). Competitiveness depends on exploiting the most abundant and cheapest factors of production in a given economy and exchanging products embodying these factors for products from other places with different factor endowments. Ricardian competitiveness depends on a static or stable level of efficiency in the allocation of resources to minimize production cost with a given technical division of labour and on the assumption that current economic conditions will continue (Oser and Blanchfield 1975). The importance of natural resources in

[17] Recalling the repeal of the Corn Laws, the influence of the free trade policies, and the original competitive state, this chapter labels this state type as a neo-Ricardian competitive state instead of the Ricardian competitive state as coined by Jessop (2002).

nearly all of Canada's provinces (Table 2-3 above) suggests that most provincial states will continue to promote their natural resources (abundant factors of production) and, in doing so, will take on a neo-Ricardian state form.

A neo-Ricardian competitive state concept means that provincial states will shift their focus from the traditional economic concerns of the U.S. market to integration and involvement in a host of new 'global' conditions, namely the global market place, transnational issues such a climate change, the challenge of international-based environmental movements, and international organizations such as the WTO. However, the importance of national states and of regions should not be underestimated or overlooked in an era of new globalization pressure (Skogstad 2000). In order to ensure the continued functioning of capitalism, Jessop (2002b) highlights new types of relationships between global, national, provincial, and local spatial scales, which competitive states will have to consider now. The political economy of 'rescaling' will have significant consequences for neo-Ricardian staples-based states. Increasing globalization and new concepts of competition have led to a wide array of new spatial scales that are becoming increasingly complex; they are tangled hierarchies rather than hierarchies simply nested one within one another (Jessop 2002a). Jessop describes this outcome as the 'eccentricity' of spatial scales. One such scale is regional and local areas that continue to retain their importance as spaces of competitiveness within the realm of globalization. The static features of natural resource production and extraction have different a different type of competitive advantage compared to economies centred on knowledge creation. The rescaling of the state has led to the reshaping of the hierarchy of regions on all spatial scales (Jessop 2002). The neo-Ricardian competitive state is a response to the nature of staples production within an open market. As a result, neo-Ricardian competitive state may become further detached from national issues and respond primarily to its role within newly rescaled areas, such as emerging trading blocs.[18]

This discussion of the Ricardian and Schumpetarian forms of the competitive state raises further questions about the role of natural resources and the state in Canada. It must be noted that all neo-Ricardian states will attempt to pursue Schumpetarian competition strategies. Thus, research will be required to determine what mix of the two strategies result in defining the identities of neo-Ricardian states and Schumpetarian states. Although the neo-Ricardian state will be responding to new spatial scales, the existing temporal path dependencies should not be overlooked. Institutional frameworks that have in some cases been fostered for over fifty years will also continue to influence the state's strategies.

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[18] Brenner (2001) refers to rescaling as "the production, reconfiguration or contestation of particular differentiations, orderings and hierarchies among geographic scales." Similarly, trading blocs refer to supranational regions whereby a number of countries form free trade zones free of protective tariff and non-tariff barriers in order to expand their trading regions. Some examples include the well-known North American Free Trade Agreement (NAFTA) to the more obscure Common Market for Eastern and Southern Africa (COMBSA).

Governance

A particularly important aspect of the competitive state is a shift from government to governance whereby states gain new important functions. This shift also precipitates a reconsideration of the changes to the policy making process. Governance refers to mechanisms and strategies of coordination in the face of complex reciprocal interdependence among actors and organizations (Jessop 2004). Three distinct modes of coordination – markets, hierarchies, and heterarchies – through their respective mechanisms (exchange, command, and dialogue) define governance within competitive states (see Table 2-4).

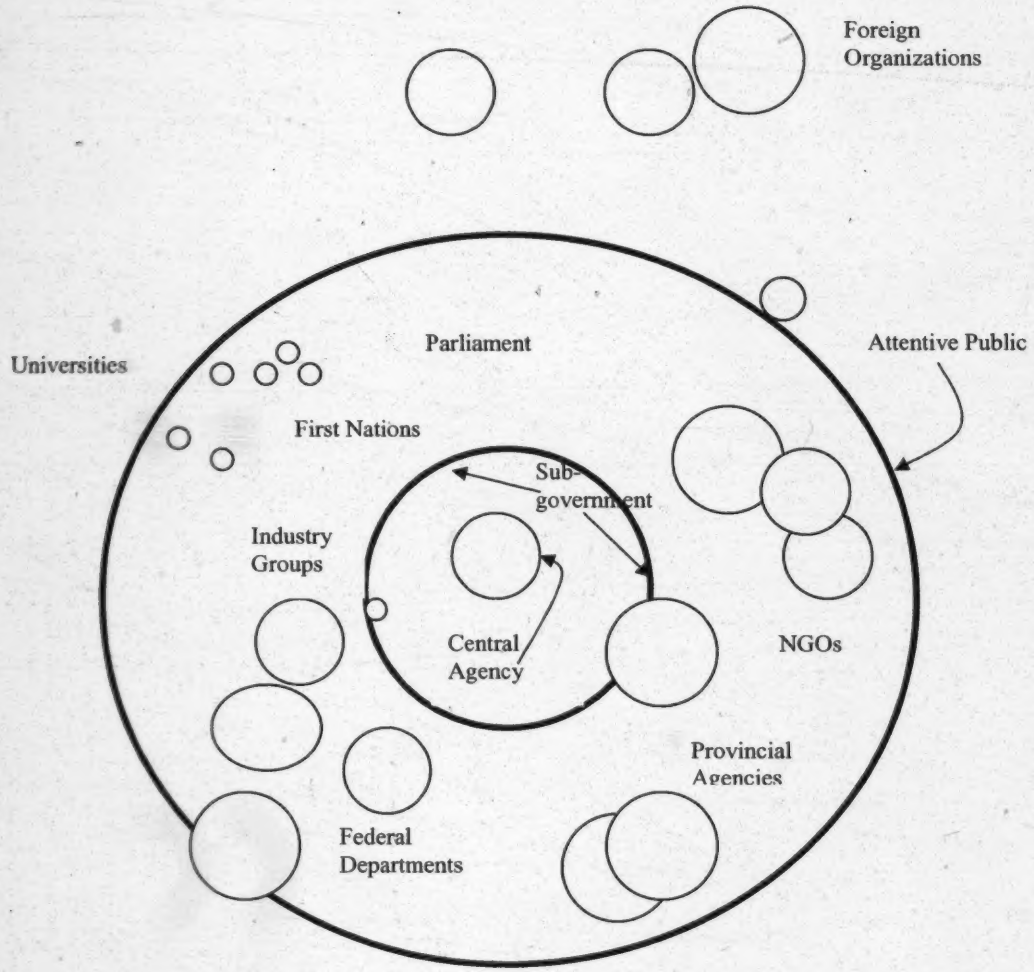
Table 2-4. Modes of coordination within competitive capitalist states

Features	Exchange (market)	Command (hierarchy)	Dialogue (heterarchy)
Rationality	Formal and procedural	Substantive and goal oriented	Reflexive and procedural
Criterion of success	Efficient allocation of resources	Effective goal attainment	Negotiated consent
Typical example	Market	State	Network
Stylized mode of calculation	Homo Economicus	Homo Hierachicus	Homo Politicus
Spatio-temporal Horizon	World market, reversible time	National territory, planning horizons	Re-scaling and path shaping
Primary criterion of failure	Economic inefficiency	Ineffectiveness	'Noise' 'Talking Shop'

(Adapted from Jessop 2003 p.3)

Market exchange refers to rational pursuit of self-interest interests by individual agent, whereas "hierarchal" command describes the form of coordination described within the policy process literature (top down, bureaucratic, goal attainment). "Heterarchy" refers to an emerging "horizontal self-organization among mutually interdependent actors" that is resistant to the top-down bureaucratic approach to coordination (Jessop 2002a; Jessop 2004). Heterarchy is an important feature of the competitive state because it attempts to reconcile and transcend the twin tendencies of market and state failure – both predominant features of modern capitalist economies.

Figure 2-1 – A typical policy community



Source: Pross (1986)

Heterarchic arrangements seek to overcome the complexities associated with "a world that is characterized by increasingly dense, extended, and rapidly changing patterns of reciprocal interdependence, and by increasingly frequent but ephemeral interactions across all types of pre-established boundaries, inta-and interorganizational, intra and intersectoral, intra-and international" (Jessop 1999b, p.179). This type of coordination contrasts with the traditional hierarchical territorial modes of coordination. The scholarly interest in heterachic arrangements implies that major problems have emerged "that cannot be managed by top-down state planning or market-meditated anarchy" (Jessop 2002b). Heterarchies can be illustrated in public-private partnerships and multi-level governance arrangements that have been well-documented in the policy literature (See Rhodes 1997; Howlett 2001b; and Jordan 2001 for broad overviews). Jessop argues that governments also tend to play a significant role in coordinating all three forms of governance in the context of 'negotiated decision-making' within what he labels as 'metagovernance' (Jessop 2002a). That is, governments play an important role in terms of the ground rules but are no longer sovereign powers but just another participant. Furthermore, Hajer (2003) argues that politics and policy making are conducted in an institutional void where institutions, such as political parties and bureaucracies based upon "territorial synchrony," are being challenged by a network society centred on policy deliberation. Furthermore, classical-modernist politics (codified arrangements) do not tell us about the "new rules of the game" (Hajer 2003). Consequently, heterarchy is an important feature to consider when examining new policy directions within a neo-Ricardian state. For example, Cashore *et al.* (2005) discuss the influence of non-state actors, in particular certification bodies such as the Forest Stewardship Council (FSC) in determining the direction of forest management practices.

Reconsidering policy communities and networks as drivers of competitive states

The evitable shift from the KNWS to a competitive state will also require a reconsideration of existing approaches to policy research. Figure 2-1 describes the policy community, one of several frequently employed frameworks in the policy science literature. This approach is based on the top-down, hierarchical, state-centred assumptions that defined the KNWS. In contrast, heterarchic modes of governance stress the role of policy networks and of non-hierarchal exchanges between state and civil society actors. Although these matters are more central there, policy communities and other frameworks will continue to be instrumental in describing meso-level features of reterritorialized competitive states. A hypothetical policy community within a competitive state is illustrated in Figure 2-3. Organizations remain the primary unit of analysis. Absent, however, is the delineation between sub-government and the attentive public. The gradual shift to a non-hierarchal, minimally bureaucratic structure eliminates the primacy of government departments and agencies as the vanguards of policy formation. In its place, lines between the various

organizations represent the horizontal negotiations amongst all policy actors. The erosion of the state's regulatory functions gives way to a coordinating role. Therefore, policy actors may continue to rely on government agencies but such agencies, are no longer the nexus of power. A dashed line denotes the boundary between the "rest-of-the-world" and the policy community, thus indicating the non-exclusivity of territorial spaces.

The persistent importance of staples production will mean that policy communities (in relation to other economic sectors) will have significant influence on the state form adopted (Figure 2-2). Natural resource based policy communities will continue to be potential drivers of economic policy within neo-Ricardian competitive states. However, a policy community's influence will be tempered by sub- and supra-level influences, such as those arising from public-private partnerships, local economic governance, the WTO, or the G-8. At the macro-state level, there is a continuum of competitive state types ranging from strongly neo-Ricardian, such as Alberta and Saskatchewan; hybrid competitive states, such as Manitoba and Nova Scotia; and strongly Shumpeterian one, such as Quebec, Ontario, and Canada as a whole.

Figure 2-2. Hypothetical policy community in a competitive state

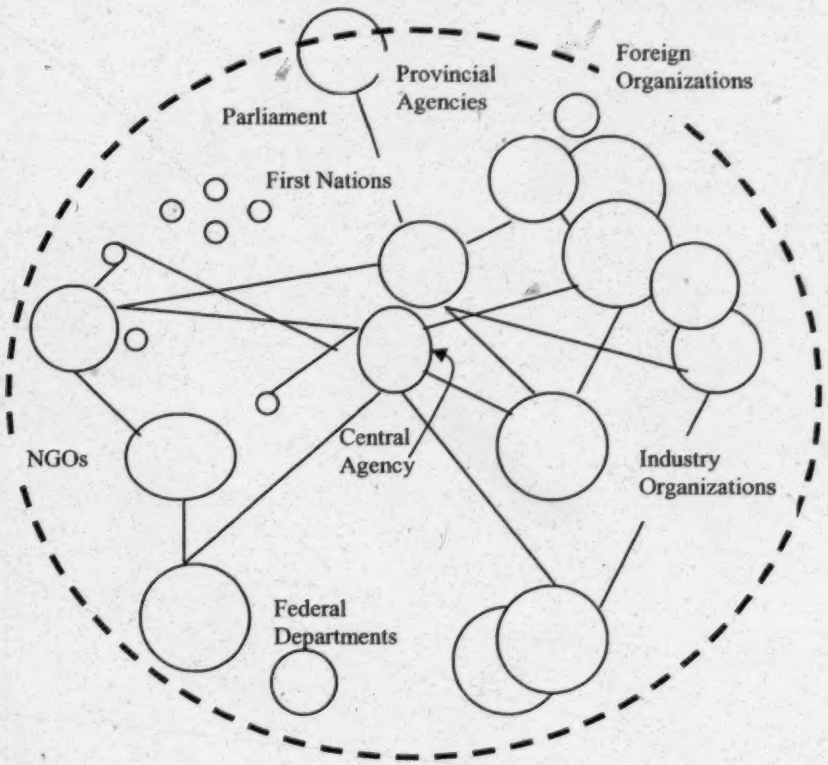
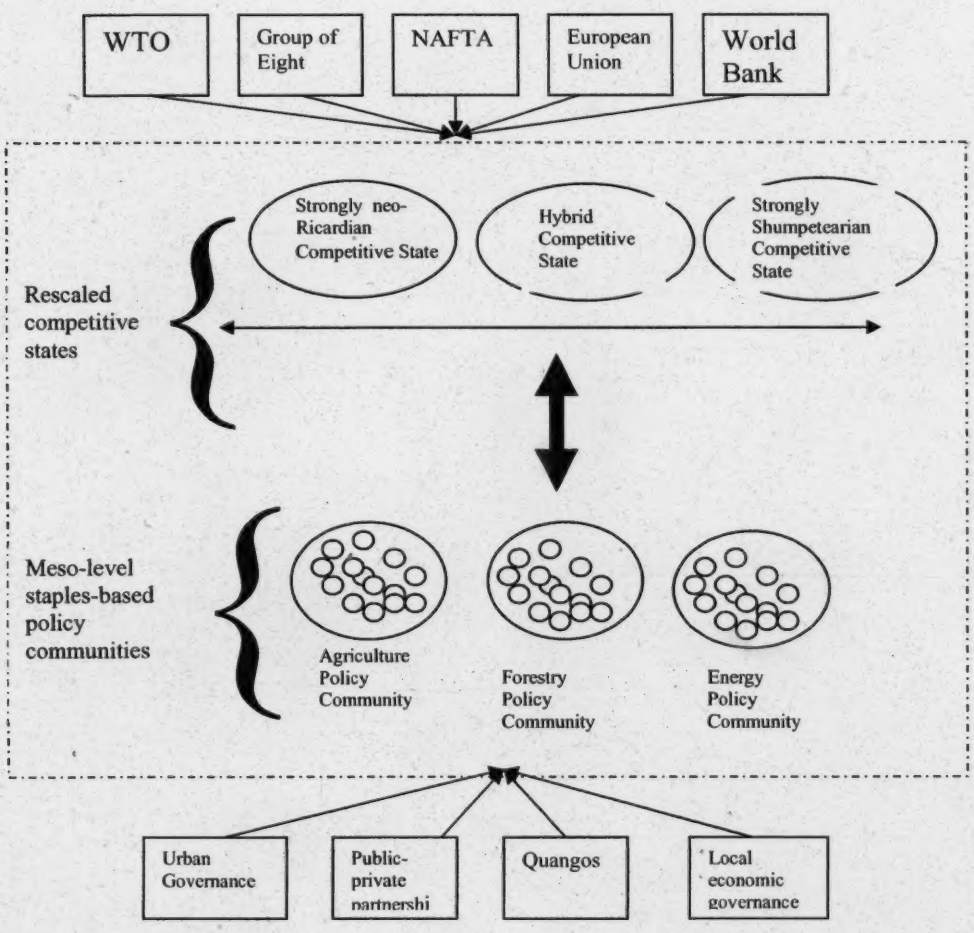


Figure 2-3. The competitive state and staples-based policy communities



Conclusion

The contributions made in this chapter bring staples and the staples thesis back into a contemporary discussion of the state and its role in Canadian politics. Within the political economy literature, there have been calls for a consideration of the "post" staples state in a post-industrial knowledge-based economy. The argument cites natural resource depletion, competition from lower cost staple regions, regional trading bloc integration (e.g., Pacific Rim), and the ascendancy of urban centres as the foci of power. These changes are particularly evident in provinces such as Ontario and Quebec, and emerging in British Columbia. However, other provincial and territories continue to remain staples dependent for their long-term economic growth.

A historical overview of both the organization of Canada's economy and the role played by staple's production as well as the evolution of the state was detailed. Table 2-1 detailed the broad chronology of this evolution from the early colonization to the present day. For much of Canada's history, the state has responded to, and, in many cases, fostered staples production. The competitive state notion recently introduced in the state theory literature provides insights into the changes occurring in contemporary economies, in particular the impact of globalization. However, globalization represents an important juncture in Canadian staples production and the role of the state. Throughout Canada's history, staple economies developed, flourished, and declined in the face of global demand. Thus, the Canadian state has always been a competitive state. However, contemporary notions of globalization have led to many scholars to reconsider the sovereign Westphalian state's role in steering its domestic economies. Therefore, in the case of Canada's staples production, a neo-competitive state was considered. The discussion provided above on state rescaling meant that the state's functions have changed rather than becoming marginalized. An important feature of state rescaling is the role that regions play in globalization. Canadian staples production, in light of globalization, is focused on provincial neo-competitive states – in particular Ricardian states focused on staples production.

The recent contributions to state theory literature permit a reconsideration of governance; this includes such concepts as reflexive modes of coordination and heterarchy (that continue to function along with more traditional market and hierarchal modes of governance). For policy oriented scholars, the changes to assumptions of th state requires a reconsideration of frameworks and models that are primarily oriented to analysis of the now waning Keynesian National Welfare State. The second half of this chapter examined how the changing assumptions of governance with the competitive state will affect the policy-making process. The shift form hieratically-based policy communities to horizontally-based policy communities were examined.

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Chapter 3 - NAVIGATING COMPLEX AND FUZZY POLICY LANDSCAPES

"The essence of tyranny is the denial of complexity." (Jacob Burckhardt, 1943. *Force and freedom: reflections on history,* p.147)

Introduction

Over the past decade, the Canadian forest sector has attracted a great deal of interest from political scientists. The political battles over contentious issues, such as timber supply, changing management practices, and land-use planning combined have been well chronicled (Cashore *et al.* 2000; Howlett 2001a). The perennial issue of trade with the United States continues to receive considerable coverage, particularly in light of the ongoing softwood lumber dispute. Global warming and climate change, on the other hand, is a relatively new issue that has the potential to alter the course of forest policy making (Spittlehouse and Stewart 2003).

Another enduring feature of the forest-based political science literature is its theoretical contributions to the policy sciences. The policy community/network (Pross 1986; Howlett and Rayner 1995), the policy regime approach (Cashore *et al.* 2000; Howlett 2001a), and the advocacy coalition framework (ACF) (Lertzman *et al.* 1996; Wellstead 1996; Wellstead *et al.* 2004) have been empirically applied and, in some cases, modified in attempts to understand the dynamics of forest policy change. Despite the advances made in the field, a number of significant gaps in the policy process literature have been identified (Coleman 1992; Daugbjerg and Marsh 1998; Howlett 2001a; Lindquist and Wellstead 2001).[19]

In this chapter, complexity theory and fuzzy logic framework are introduced as a theoretical approach to reconciling four particularly pressing gaps within the current policy-process literature. The first gap identified is an undeveloped or incomplete conception of policy-making organizations. Policy-making frameworks require the implicit integration of both intra- and inter-organizational dynamics. The next gap discussed is the interaction between different policy-making levels not previously incorporated into policy process frameworks. Typically, sectoral-level policy making has been the object of exclusive investigation. A consideration of the larger policy domain as well as decision-making at the sub-sectoral level needs to be developed. Many single-field policy researchers have advocated systematic analysis but they fail to acknowledge total political consequences (Doern and Wilson 1974; Daugbjerg and March 1998). Thirdly, policy process frameworks neglect a coherent well-developed treatment of two key political science concepts: power and state sovereignty (Peterson 2004). The concept of power within group based policy-process frameworks is narrowly understood in relation to the conflicts of different interests between competing groups (Chilcote 1994). However, expressions of power and basic power relationships are often vaguely presented without elaborating upon the abilities of policy actors to manipulate other policy actors. And finally, the

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[19] Recently, Lindquist and Wellstead (2001) identified organizational capacities and commitments, the perspectives of field workers, the role of science and experts, community adaptation and governance, measuring values and beliefs, policy-making rhythms, and aggregating specific approaches as pressing policy research gaps within a Canadian forest sector.

intrinsic vagueness and subsequent difficulties of determining causality within complex policy-making systems needs to be determined – particularly policy process frameworks attempt to capture power, organization dynamics and the multiple level nature of decision-making.

Recent literature has examined problems associated with complexity and policy-making. For example, Lindquist and Wellstead (2001) point to an increasing number of policy actors and issues as contributing factors within the Canadian forest sector. They identify a long list of diverse forestry policy actors ranging from traditional players such as provincial forestry departments, federal agencies, and the forest industry to more recent actors, such as aboriginal and international environmental groups. These organizational entities, they argue, have different capacities, commitments, competencies, and levels of engagement in issue areas. While Lindquist and Wellstead (2001) provide a good overview of the symptoms of complexity within the Canadian forest sector, they overlook the causes of such complexity. The major source of complexity is the impact of globalization and subsequent changes to governance with modern capitalist states. Many observers point to the decline of the Keynesian National Welfare State (KNWS) and the emergence of new state forms that increasingly respond to a growing internationalized policy environment (Coleman and Perl 1999; Brenner 2004; Jessop 2004).

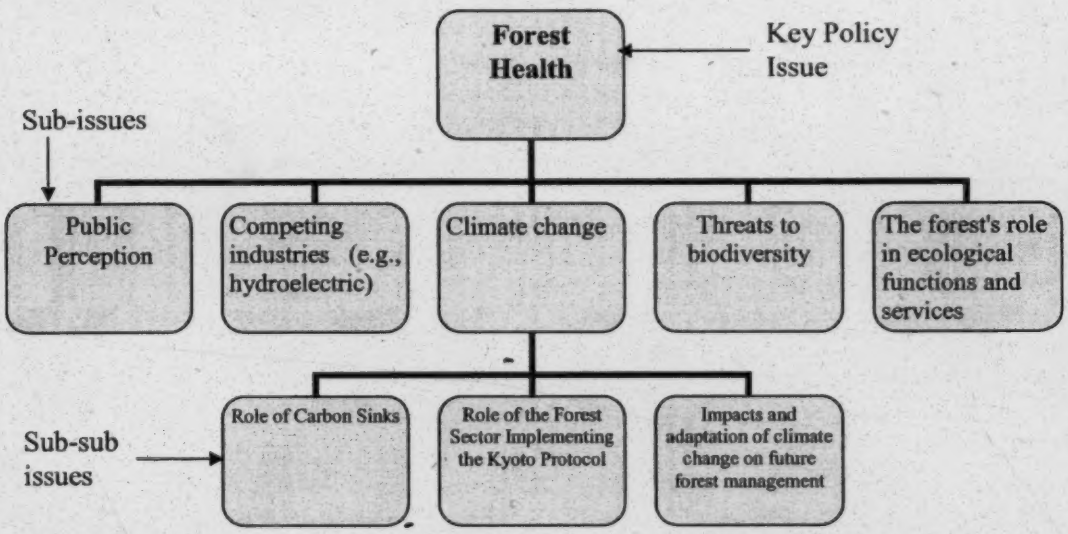
Issues are also fraught with inherent complexities of their own. The relative importance of particular major issue areas is constantly changing and often overlapping with other issue areas (Kingdon 1984; Baumgartner and Jones 1993). Moreover, they never really begin or end (Baumgartner and Leech 1998). Within these issue areas are a host of associated sub-issues, and, in many cases, sub-sub issues. At this point, it is worth highlighting 'pressing' Canadian forest policy issues identified by the National Forest Strategy Coalition (NFSC) within the sector as an example (Figure 3-1) (National Forest Strategy Coalition 2003).

Figure 3-1. 'Pressing' Canadian forest policy issue areas as defined by the National Forest Strategy Coalition

- Forest health
- Sustainable management
- Oversight and the role of government
- Aboriginal peoples
- The future of the forest industry
- Forest knowledge
- Forest communities
- Forest regeneration

In the case of 'Forest Health', in Figure 3-2 below, a number of sub-issue areas are identified. From these sub-issues, possible sub-sub issues can then emerge, creating a morass of multiple and overlapping concerns.

Figure 3-2. An example of a forest issue and its related sub-issues


Forest Health
Key Policy Issue
Sub-issues
Public Perception
Competing industries (e.g., hydroelectric)
Climate change
Threats to biodiversity
The forest's role in ecological functions and services
Sub-sub issues
Role of Carbon Sinks
Role of the Forest Sector Implementing the Kyoto Protocol
Impacts and adaptation of climate change on future forest management

Therefore, policy actors face a bewildering landscape of policy issues, their associated sub-issues, and sub-sub issues. Complicating the situation for the researcher is analyzing these actors and issues within multi-level governance structures.

Chapter outline

First, this chapter provides a review of several popular policy frameworks that have been employed by Canadian (in particular) forest policy scientists; they include the policy community/policy network approach, the advocacy coalition framework (ACF), and the policy regime approach. The following section reviews the theoretical shortcomings and challenges inherent within the identified policy process frameworks: the absence of organizational theory, the need to consider the concept of power, and levels of policy making. A consideration of complexity theory and fuzzy logic in the third section addresses and reconciles these challenges. Complexity theory and fuzzy logic though widely used in the social sciences, are rarely applied in political science. The section concludes by amending a recent political science complexity framework developed by Geyer (2003) in order to develop a complexity-

based policy process framework. The final section critically reflects on bridging the theoretical contributions made in this chapter with empirical future applications.

Conceptions of the current forestry policy landscape

In Canada, the policy community and the policy network approaches carry considerable currency in policy-related research. Paul Pross (1986) is credited for popularizing and providing a uniquely Canadian approach. Before discussing Canadian contributions, two major streams of policy network literature are highlighted. Although, a contested terminology permeates the policy network literature, surprisingly little has been done to disentangle the subtleties that pervade the field. Börzel's (1998) and Rhodes' (1997) reviews of the policy network literature are notable exceptions.

There are two major policy network "schools": Anglo-Saxon and German (Börzel 1998). The Anglo-Saxon school – which has similar tenets in both Britain and the United Sates -- focuses primarily on the interaction between state and societal actors in networks that are conceptualized as an analytical tool for developing different taxonomies of state-societal relationships. By contrast, the German policy network school is centred on the institutionalized, often non-hierarchal, exchanges between the state and civil society actors. [20] The Anglo-Saxon school presents a metaphorical model of policy networks which contrasts with the "governance" approach of the German school that seeks to empirically examine network relationships. Both of these policy network approaches are applicable within a complexity policy framework.

The Anglo-Saxon policy network approach, which originated in the US, was, in part, a critique of pluralism. The early American contributors sought to highlight the privileged role of tightly knit bureaucrats, Congressmen, and interest group representatives in forums known as "iron triangles" (Rhodes 1997). In his comparative study of British and Swedish social policy, Heclo (1974) also introduced the concept of the "issue network." These networks contained more inclusive organizations that were critical of current policy directions and generated alternative ideas for new policy initiatives.

Two of the most widely cited network typologies emerging from the Anglo-Saxon approach are the Rhodes model and the Wilks-Wright model (Peterson 2003). Both models respond to the rapidly changing nature of British governance that, since 1979, has resulted in a spate of new policy actors (Rhodes 1997). The Rhodes model considers the power dependence and processes of exchange between policy actors. Policy networks become defined by the stability of their membership, the degree of

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[20] The German school originated mostly from the research undertaken at the Max-Planck-Institute für Gesellschaftsforschung located in Cologne, Germany (Börzel 1998). Prominent scholars from the Institute include Edgar Grande, Patrick Kenis, Renate Mayntz, Firtz Scharpf, and Volker Schneider. The Centre for Democratic Network Governance located at the Department of Social Sciences, Roskilde University, Demark shares very similar goals as the Max-Planck-Institute für Gesellschaftsforschung but considers its research as oriented towards a "second generation" of network governance (Max-Planck research, they consider first generation) that empirically focuses on the consequences of new governance regimes (Centre for Democratic Network Governance 2005). The key network governance literature includes Kooiman 1993; Kickert *et al.* 2000; Scharpf 2001; Koopenjan and Klijn 2004;

insularity, and the strength of resource dependency and exchange. These factors produce five types of networks described in Table 3-1: policy communities, professional networks, intergovernmental networks, producer networks, and issue networks.

Table 3-1. Policy community and policy networks: the Rhodes typology

Type of Network	Characteristics of network
Policy community	Stability, highly restricted, vertical interdependence[21], limited horizontal articulation
Professional network	Same as the policy network except that it serves the interests of professions
Intergovernmental network	Limited membership, limited vertical interdependence, extensive horizontal articulation
Producer network	Fluctuating memberships, limited vertical interdependence, serves the interest of producer
Issue network	Unstable, large number of members, limited vertical interdependence

Adapted from Rhodes (1997).

Wilks and Wright (1987) also presented a powerful typology distinguishing the policy level and policy actor. Table 3-2 below shows four policy levels, policy actors, and natural resource/forestry related examples. The policy area refers to very broad categories such as industry, transportation, health, or in this case, natural resources whereas those actors within a policy area comprise a policy universe. A policy sector, which refers to a specific part of a policy area such as forestry, mining, or fisheries, involves actors in a policy community who share an interest in a particular industry and interact with each other. Policy sub-sector actors are engaged in specific exchanges, usually dealing with a particular issue within a policy community or between different policy communities.

Table 3-2. Wilks and Wright typology

Policy level	Policy actors	Examples
Policy area	Policy universe	Natural Resources-Environment
Policy sector	Policy community	Forestry, Mining, Fisheries
Policy sub-sector (forestry)	Policy network	Timber supply, Forest health, land use planning

Adapted from Wilks and Wright (1987)

The policy network analysis most often applied by Canadian political scientists is the Wilks and Wright (1987) typology in which the most notable distinction is made between the policy communities and policy networks. A policy community, according to Pross (1986), is defined as the structural configuration of the policy

[21] Here Rhodes describes vertical interdependence as the linkage between levels of government

actors who participate in the policy process within a particular sector. More specifically, according to Coleman and Skogstad, policy communities "include all actors or potential actors with a direct or indirect interest in a policy area or function who share a common policy focus, and who, with varying degrees of influence shape policy outcomes over the long run" (1990, p.45). Policy actors often share similar economic, political, and technical interdependencies (Coleman and Perl 1999). A typical policy community is divided into two segments: the "sub-government" and the "attentive public." The sub-government, at the center of any policy community, includes those senior government personnel who are in positions of direct responsibility for a particular policy sector, and, in some cases, nongovernmental organizations, such as industry groups, which have become established and engaged day-to-day participants in policy formulation and implementation. Sub-government actors attempt to maintain what Baumgartner and Jones (1993) refer to as a "policy monopoly." Policy monopolies are successful when they function within a definable institutional structure with limited access and are driven by a powerful idea (Baumgartner and Jones 1993). Forest policy communities in Canada are dominated by large omnibus natural resource provincial agencies and large highly integrated industrial forest companies holding long term tenure agreements (Howlett and Rayner 1995; Wellstead 1996).

Conversely, the "attentive public" comprise those actors within a defined policy community such as pressure groups, professional organizations, other government departments, and international organizations who are capable of influencing policy but who do not participate in policy-making on a regular day-to-day basis. The attentive public are constantly questioning and occasionally undermining the sub-government's monopoly. Other policy actors, those outside the sub-government's policy monopoly, include other provincial agencies, universities, federal government agencies, First Nation groups, environmental groups, and consultants. Over the past decade, the attentive public throughout Canada's forest policy communities has grown, sometimes challenging the collaborative policy-making monopoly held by province government forest agencies and the forest industry.

Policy communities define those actors involved in the policy process, policy networks describe the types of relationships between governmental and non-governmental actors that develop when responding to the various issues dominating a policy community (Pross 1986) (Lindquist 1992). The policy network employed by Canadian political scientists is a descriptive metaphorical approach highlighting the types of relationships existing among policy actors. A large body of literature describing a variety of government – civil societal relationships determined by such factors as resources, degree of institutionalization and rules of conduct has emerged (Coleman and Skogstad 1990; Lindquist 1992; van Waareden 1992; Howlett and Rayner 1995; Howlett 2001; Howlett and Rahmesh 2003).

Coleman and Skogstad (1990) developed a classification of policy networks based on governmental and societal powers and organizational capacity. They described pluralist policy networks as those involving many actors, which can then be characterized by the dispersal of power between government and society (pressure pluralism), either when societal actors are disorganized (cliental pluralism) or when both state and society are well organized (parentaela pluralism). In closed policy networks, on the other hand, policy making is concentrated within a small group of government agencies and one (concertation) or two or more (corporatist) societal organizations. The state-directed policy network, the third type described by Coleman and Skogstad (1990), is characterized by highly autonomous, coordinated government agencies dominating the policy-making process. Howlett and Rayner (1995) argued that Canadian forest policy networks are best described as closed.

The policy community-network approach provides a useful way of systematically characterizing the structural relationships among a vast array of policy actors. This approach complements to a body of research explaining the dynamics of policy change, namely the advocacy coalition framework (ACF). The ACF addresses one of the key criticisms of the network approach - its weakness as an explanatory model of political behaviour and policy change (Dowding 1995).

Originally introduced in 1988 and subsequently enhanced by Sabatier and Jenkins-Smith, the ACF sets out to explain the process of policy change by considering the role of beliefs and the mobilization of information in addition to power struggles between competing interests (Jenkins-Smith 1988). It argues that policy actor's beliefs serve as perceptual information filters (Schlager and Blomquist 1996). The ACF's emphasis on hypothesis testing attracts policy scientists who wish to undertake a systematic comparative analysis of a policy process.

There are four key elements in the ACF. First, events external to the policy community are considered primary inducements for major policy shifts and constrain the actions of the policy actor. Second, measuring the impacts of policy change and policy learning requires a time perspective of a decade or more. Third, policy change occurs within what Sabatier and Jenkins-Smith refer to as political subsystems (policy community) as the unit of analysis. The policy community will often be populated by more than 30 organizations. Sabatier and Jenkins-Smith (1993) found that there are typically two to four key competing coalitions within a policy community. Fourth, what differentiates one advocacy coalition from another is a three-leveled hierarchical belief system. From these belief systems, competing coalitions develop their overall policy direction and devise specific programs. A policy oriented belief system is arranged according to three distinctive categories: a *deep normative core*, a *policy core*, and the *secondary aspects.* The deep core, which is equated with the personality of an individual, is nearly impossible to change. The policy core belief, which is the basic strategy and overall policy position of a coalition is possible to change but very difficult. Over a long period (greater than a decade) in which the

core beliefs are in dispute, the line-up of allies and opponents tend to stablize over a decade or so (Sabatier and Jenkins-Smith 1993). Actors will show substantial consensus on issues pertaining to the core and less on secondary aspects. Secondary aspects are the instrumental decisions associated with the policy core. A statutory revision is an example of a change in a secondary aspect. Most routine policy changes occur at the secondary aspect because it does not threaten the dominant coalition's core policy belief. As a result actors are willing to give up secondary aspects more readily.

Changing a coalition's core policy belief would eventually alter the basic perception of policy problems as well as the general policy prescription of an issue (Jenkins-Smith 1988). But as long as the dominant advocacy coalition remains in power within the subsystem, belief systems are unlikely to change, and the core attributes of a government program are unlikely to be significantly revised. According to the ACF, changing core beliefs requires significant perturbation external to the policy community such as changes in socio-economic conditions, changes in the systemic governing coalition or a change in public opinion. Sabatier and Jenkins-Smith (1993) identified policy-oriented learning between actors as another source of policy change within policy communities. Policy learning refers to the "relatively enduring alternations of thought or behavioural intentions that result from experience and/or new information and that are concerned with the attainment or revision of policy objectives" (Sabatier and Jenkins-Smith 1999). Such learning can occur within a coalition and amongst competing coalitions.

Sabatier and Jenkin-Smith (1993) maintained that policy learning's influence upon policy change requires a number of common factors. First, coalitional members should have the technical resources to engage in analytical debate. Debate among competing coalitions must be engaged at an intermediate level of conflict between competing policy actors. Third, policy learning is more likely where there exists a professional forum that is open to all participants. Policy learning becomes problematic in a closed forum where many policy community members are excluded and alienated (Jenkins-Smith 1988).

New theoretical challenges

The policy community, policy network, and the ACF attempt to explain the policy process within the confines of a particular sector. These frameworks were developed with the explicit goal of overcoming a research paralysis associated with tackling the totality of modern governance. The growing scholarly specialization in such areas as agriculture, education, forestry, and transportation (to name only a few) reflect both a dilemma and an opportunity. Policy researchers find themselves relying on policy process frameworks, which limited in scope, provide a powerful and convincing explanation for policy change. The next section considers the interconnectness of the larger policy system while avoiding the dangers of an

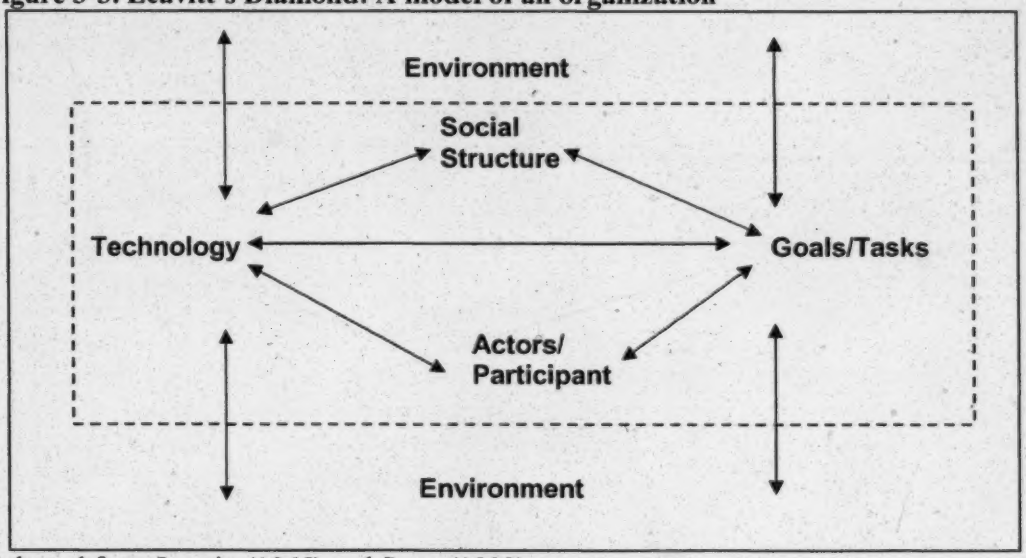
approach that considers the "interrelationship of everything to everything else" (Doern and Wilson 1974; Atkinson and Coleman 1992). This section examines the role of the organization followed by a consideration of multiple levels of policy actor involvement, and then a consideration of power.

The organizational dynamics gap

Policy actors are most often equated with organizations (Pross 1986; Coleman and Skogstad 1990; Cashore *et al.* 2000). Sparse attention, however, has been paid to interactions within policy community organizations themselves. Instead, research tends to be focused on the organization's role and function in its environment (policy communities, policy networks etc.) and its influence on determining policy outcomes. Easily measurable indicators such as the number of staff, resources available, and their skill-sets have been identified determinants of governmental and social organizational capacity, commitment, and competency change at different levels (Lindquist 1992; vanWaarden 1992). However, these attributes only represent one component of a policy organizations capacity that can and will vary. The organizational response by policy actors requires a rigorous consideration of intra-organizational dynamics.

Within organizations are complex, often informal, social groups that have a life of their own and have become highly adaptive within their environments (Selznick 1991). In his study of the Tennessee Valley Authority (TVA), Selznick stated that all "formal organizations are molded by forces tangential to their rationally ordered structures and stated goals" (1965 p. 78). Furthermore, organizations develop informal structures that reflect "the spontaneous efforts of individuals and subgroups to control the environment" (Selznick 1965 p. 45). An often-quoted passage by Selznick states that organizations "become infused with value beyond the technical requirements of the task at hand. They become institutionalized" (1957, p.235). This passage makes the distinction between the rational, means-oriented, efficiency-guided process of administration and the value-laden adaptive process of institutionalization (Perrow 1986). An organization's informal functions and networks led Selznick to follow Benard's (1938) earlier works, which gave credence to the importance of leadership (Scott 1992) and organizational culture (Wilson 1989) as important features in organizational theory. Thus, the long-term security of an organization becomes as important as its formal goals (Selznick 1991).

Figure 3-3. Leavitt's Diamond: A model of an organization



Adapted from Leavitt (1965) and Scott (1992)

A perplexing challenge for the policy scientist considering the role of organizations in the policy process is identifying the key elements in the organizational theory literature. In Figure 3-3, Leavitt's (1965) 'diamond' provides a simplistic but useful heuristic tool identifying very broad but common internal aspects of any organization. Regardless of the type of organization (company, volunteer not-for-profit, government agency), all will have participants, a social structure, formal and informal goals, and use technology (Perrow 1961). Moreover, all will influence and be influenced by their environment. Participants are those individuals who in return for a variety of inducements (money, prestige) make contributions to an organization (Scott 1992). As discussed above, leadership plays a critical role in maintaining and ensuring that an organization can continue to function (Barnard 1938). The purpose of an organization's leadership is to instill its participants with a high sense of identity, purpose, and commitment (Perrow 1986). The social structure denotes the relationships between individuals within the organization, in particular their activities and interactions. An organization's goal is among the "most slippery and treacherous concepts" used by organizational analysts (Scott 1992). While some goals are well publicized, unofficial goals and commitments can emerge and in some cases can be contradictory.

Technology refers to mechanisms for transforming inputs into outputs. The range of technologies employed by organizations is wide. They can include the use of machines that turn raw material into products (e.g. a pulp and paper mill that turns

wood fibre (raw material) into paper). Typically, policy oriented organizations utilize the knowledge of its individuals in order to make decisions. Here, the tasks of individuals become particularly important in the production of such outputs. Tasks can be routine or non-routine, depending on the degree of specialization within different sub-units (Lawrence and Lorsch 1967; Perrow 1986).

The final element introduced in Figure 3-3 is an organization's environment. This is a particularly useful concept because of the overlap with the above policy process literature and its exclusive focus on inter-organizational behaviour within policy communities. Those theorists examining organizational environments have undertaken a variety of approaches in developing an understanding of how and why organizations interact with one another (Dill 1958; Emery and Trist 1965; Lawrence and Lorsch 1967; Warren 1967; Terreberry 1968; Child 1972). Emery and Trist's (1965) concept of a "causal texture of the environment" proves particularly useful because it incorporates an understanding of the environment itself. Emery and Trist found that an organizational environment is more stable and predictable when organizations are loosely coupled and somewhat independent. When a network is tightly coupled and highly interdependent, the environment becomes more unpredictable and dynamic (Emery and Trist 1965; Haas 1976; Metcalfe 1978, 2004). Metcalfe (2004) found a close relationship between the types of organizational environment and organizational capacity.[22] The simpler and more stable the environment, the more each individual organization will tend to focus only on its internal organizational efficiency. As environments become more complex and dynamic, organizations will shift their attention to managing their external relations (Metcalfe 2004).

From this overview of organizational theory, policy actors are no longer treated as homogenous organic entities. An organizational component in policy research helps elaborate on the crucial complexities that would otherwise lead to a distorted view of the policy process. For example, all forest-related provincial government agencies tout sustainable management as an important organizational goal. However, across each of Canada's forest policy communities, policy responses differ considerably due to three notable overlapping factors. First, the dominant eco-physical features that characterize the forest composition within each province vary considerably. For example, the management of Douglas-fir on Vancouver Island will vary from the management of black spruce in Northern Ontario. Second, as discussed above, divergent policy responses are a product of the interaction between policy actors and policy beliefs on a number of pressing issues within policy communities and policy networks. For example, the provinces of Quebec and Ontario contain similar boreal forest ecosystems, yet their policy communities and policy networks vary considerably (Bouthillier 2001; Lawson *et al.* 2001). Finally, as highlighted throughout this section, organizational features also affect policy responses. Organizations themselves are complex entities laden with values often

[22] Emery and Trist (1965) identify four types of (increasingly turbulent) organizational environments: 1) stable homogeneous; 2) stable differentiated; 3) disturbed reactive and 4) turbulent environments.

distinct from the official goals they set out. Furthermore, organizations are constantly evolving, responding to both their environment and their inner complexities.

A definitive organizational study of a Canadian forestry agency has yet to emerge. Two American notable studies, namely, Herbert Kaufman's (1960) *The forest ranger* and Steven Yaffee's (1994) *The wisdom of the spotted owl* best exemplify the role of organizational dynamics and its effects on agency decision-making, and its role in producing policy outcomes. Therefore, an agency's response will differ from issue to issue.

Level of policy-making gap

Policy process frameworks, which focus on (specialized) sectors, have turned their attention to those policy actors with direct interests and away from legislative power-oriented decision-making. Thus policy-making is focused on the bureaucratic relationships between the state and a variety of societal actors. This approach is attractive because those in the bureaucracy's middle echelons often influence government direction. "While not the most powerful participants," Heclo (1978) argues that "these agents of change usually have access to information, ideas, and position outside the normal run of organizational actor" (p. 235). However, Coleman (1992) points out that by considering only the meso-sectoral level, there is the possibility the macro structural context will be overlooked. There has been some commentary concerning the interaction between different decision-making levels (Figure 3-4 and Table 3-3) (Coleman and Skogstad 1990; Atkinson and Coleman 1992; Coleman and Perl 1999; Sabatier and Jenkins-Smith 1999; Cashore *et al.* 2000; Howlett 2001a). A contrasting but equally common practice is presenting states or civil societies as holistic; that is, some scholars "have given the misleading impressions that at key junctures in their histories, states or societies have pulled in single directions" (Migdal 2001 p.98). The studies of struggles within society (e.g. class, gender, race, organizational) are obscured when the state is given "ontological status" and treated as an organic entity. Disagreeing with the concept of the state, Migdal (2001) draws attention to the state's engagement with social forces and considers its multiple levels. "Social scientists," he states, must develop a new 'anthropology of the state.' The state is simply not a reflection of the will of its leaders but an arena where social forces and groups interact. Within the state, the "calculus of societal pressures" differs markedly. Such pressures affect four levels of state organization: the trenches (similar to Lipsky's (1980) street level bureaucrats), dispersed field offices, the agency's central offices, and the commanding heights (the executive leadership). As illustrated in Figure 3-4, policy-making can occur on a number of different levels. Table 3-3 details the nature of issues found at different decision-making levels and the make-up of policy actors. At each level, a different configuration of actors and issues is involved. There may be overlap in terms of organizational membership. If such overlap exists, the capacity, commitment, and

competency of an organization will inevitably vary. Moreover, the decisions made at one level may impact other levels (as illustrated in the arrows in Figure 3-4). These impacts can be both top-down and bottom up.

Federalism is also an important consideration when examining multiple levels of decision-making in Canada (Cairns 1988). Furthermore, Canada's federal condition is constantly in flux, particularly with the recent impact of neo-liberal international arrangements (McBride 2003). The debates concerning federalism affect not only the national policy domain but also policy communities. Forestry is no exception. Because 71% of Canada's forests is under provincial and territorial jurisdiction and control, policy scientists have typically focused on provincial sectoral-level policy elites, their interests, their beliefs, and their institutions.[23] Each province and territory has its own unique set of forest-management statutes, policies and regulations, making them attractive venues for empirical research. Analysis of the federal government's role in the forest sector typically focuses upon its ability to influence provincial policies (Howlett 2001b). However, the federal government is not completely marginalized in its activity in the forest sector and can be found as an active participant in such areas such as research, pesticide regulation, training, and Aboriginal affairs (Canada 2003). Moreover, other federal departments such as Environment Canada and Foreign Affairs Canada (FAC) are important policy actors in such areas as environmental regulation and trade. FAC has played a significant role in the U.S.-Canada softwood lumber dispute with the Untied States.

Policy scientists have yet to incorporate the interactions of the heterarchic level labeled on the bottom of Figure 3-4. Heterarchy, a term employed by Jessop (2002), describes a mode of coordination within the changing structure of the capitalist state that is neither hierarchal nor market-based but rather refers to "horizontal self-organization among mutually interdependent actors" (p.245). Within the forest sector, heterarchic networks could include forest dependent communities, the role of public participation, science and experts, and First Nations (Lindquist and Wellstead 2001).[24] The role of public participation and engaged forest communities, for example, has been identified as important aspect of the Canadian Council of Forest Ministers (CCFM) Criteria and Indicators for Sustainable Forest Management iniaitive. However, federal and provincial policy makers (as well as in policy-process frameworks) grapple with the operationalization of public participation in the realm of decision-making. The heterarchic level represents a new trend in governance corresponding to the German School of policy network research. One of its features is incorporating the role of increased citizen engagement and partnerships with different levels of government that have become difficult to implement by centrally concerted policy institutions (Börzel 1998). Moreover, network structures become focused on the non-hierarchal forms of interaction between public and private actors. Pal (2000) states that the growing trend in public consultation within Canada is largely found at the operational and programmatic levels whereas values associated

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[23] The remaining 29% of Canada's forested lands are privately held (26%) or controlled by the Federal government (3%) (Canada 2003)

[24] The inclusion of heterarchic networks, in part, provides an explanation of the public's role within the policy making process. Traditionally, policy-making frameworks were focused on the interactions of policy elites.

with broad policy development are found at the national or provincial levels. Thus the 'interlocutors' are those agencies that are responsible for program design and delivery within a particular policy community or network (Pal 2000). The German policy network school provides only a partial explanation of the different dynamics found at the heterarchic policy-making level in Canadian forestry. These new form of governance may eventually become to dominate other levels as traditionally hierarchal forms of governance falter or fail (Kenis and Schnieder 1991). Finally, policy process frameworks must be responsive of the internationalization impacts such as global markets and transnational institutions (Knill and Lehmkuhl 2002). More importantly, as illustrated in Figure 3-4, international influences flow to all decision-making levels.

Figure 3-4. Multiple policy making levels (systems)

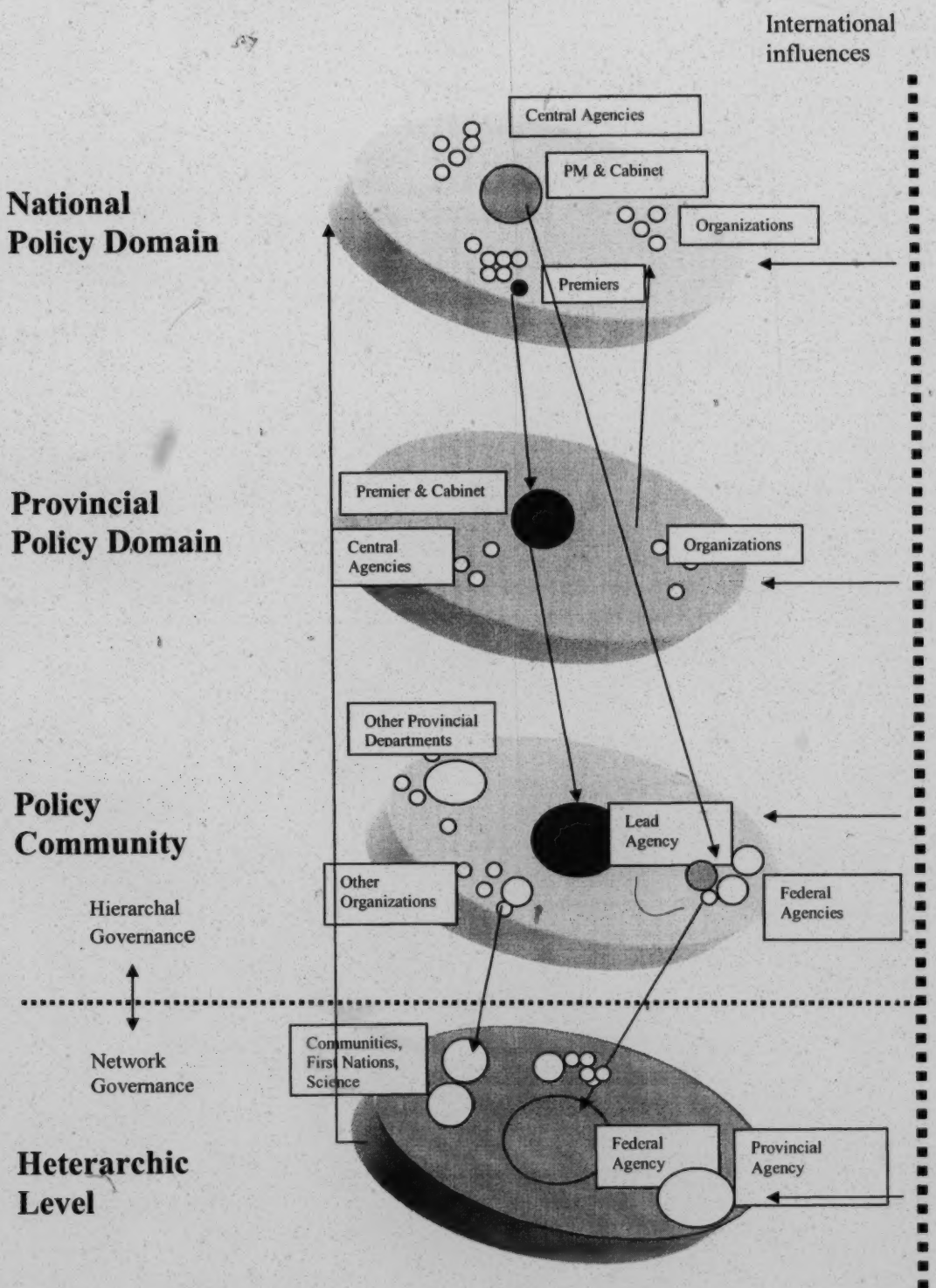

Table 3-3. Decision-making systems within the policy process

Fields	Issue orientation	Organizational actors	Examples of organizational representatives	Number of actors
National Policy Domain	Broad but maybe sector focused if it falls within its federal jurisdiction	Largely governmental	Prime Minister, Cabinet, Senior advisors from Central agencies, executive federalism	Few
Provincial Policy Domain	Fairly Broad and often overlapping with National Domain. May be sector focused if it falls within it federal jurisdiction	Largely governmental	Premier, Cabinet, Senior advisors from Central agencies, key business organizations	Few
Policy Community	Sectorally specific but can involve overlapping policy communities	Highly variable mix of societal and government actors	Minister(s) and senior staff, directors of industrial organizations	Many
Heterarchic Network	Highly specialized or localized	Largely societal driven	Regional directors and managers Grass roots activists	Variable

Power and the state sovereignty gap

Power, at the heart of all politics, is exercised by and embodied within the state (Jouvenal 1962). Policy scientists tend to equate the state with specific departments and agencies containing a standing army of civil servants, more specifically a highly specialized corps of specialists and experts who engage with other policy actors within specific networks. This conception understates the larger role of representative government and issues of sovereignty and power. The policy community-network approach, for example, relegates parliamentary actors to the margins of the attentive public. For Sabatier (1993), the basic legal structure as well as what he refers to, as "changes in systematic governing coalitions" become exogenous influences that act on the specific policy subsystem.

A notable exception is Kingdon's (1984) agenda setting framework, which specifies three relatively independent streams of policy influence – the problem stream, the political stream, and the policy stream – all help explain how public policy is formed and comes to the forefront of a government's agenda. He identifies three "streams" of concern in the political process. First, the "problem stream" contains a variety of problems needing to be addressed. Their priority in the stream remains fluid, determined by various factors, such as crisis events, symbolism, and issue visibility. Second, the "policy stream" contains a wide range of ideas that can potentially become become solutions to problems in the problem stream. Proposals may be new, or they may linger for years until they appear to be "appropriate" (Kingdon 1984). Third, events in the "political stream" occur independently of the other two streams. Personnel changes, constituent and interest group mood and opinion, shifts in ideology, and power all contribute to defining the political climate in which policy formation occurs. The political stream is the most critical avenue towards placing an item on the agenda because it is politicians who set the agenda. Policy proposals become reality when there is a "coupling" of the streams: the joining together of a high priority agenda item from the problem stream with a solution from the policy stream, all at a time in the political stream when the climate is "right" for a change. Facilitating this process is the policy entrepreneur, an individual who is willing to invest time, energy, reputation, and sometimes money in the hope of some type of reward. Finally, the policy window is an opportunity for action on an issue. It enables an issue to move from the institutional agenda (where it has received serious attention) to the decision agenda (where it has more active status and may be under review for an decision). Windows open briefly and infrequently, usually because of a change in the political stream. Kingdon's agenda setting framework is able to explain how specific policy issues enter the fray of larger political power struggles within the state. Nonetheless, at best, the policy process literature presents an opaque understanding of the modern sovereign state.

Incorporating complexity theory and fuzzy set theory

The challenges associated with incorporating organizational dynamics, multiple policy-making levels, and the necessity to consider power presents a challenge to the established policy process frameworks discussed above. Policy actors (organizations) take on multiple roles and, depending on their capacity, commitment, and competency, may have significantly different abilities to impact a variety of decision-making levels. Furthermore, policy actors are no longer neatly confined within a set decision-making level nor do they deal exclusively with one particular issue level at a time. Political power that was previously marginalized moves to the forefront in the policy process research agenda. Thus, policy researchers are confronted with new sources of uncertainty (when causal processes are unclear), complexity (when casual processes are too numerous), or a combination of all three (Roe 2001).

In this section, complexity theory and fuzzy theory are introduced as "a new way of thinking" with their own vocabulary, concepts, and methods. Complexity theory has been successfully employed within the physical sciences for a number of years (for its development, see Nicolis and Prigogine (1989) and Kauffman (1996)). At the heart of complexity theory are non-linear systems based in a realist program of scientific understanding which critiques the totality of both linear rational-based reductionism and the ontological and epistemological claims made by post-modernism, in particular chaos, irrationality, and unpredictability (Byrne 1998; Geyer and Rihani 2000). Complexity theory presents a third option that argues that through history may be progressive, it is, at times very uncertain (Geyer and Rihani 2000).

At the core of complexity theory is an emergent adaptive system. At first glance this system may appear to be a cluster of unrelated activities, however, it is actually a number of well defined interrelationships between many agents. The capacity of the agents to break with routines and initiate unfamiliar feedback processes is what makes the system complex (Jervis 1997; Walby 2003). The capacity of the agents to cope collectively with new challenges is what makes the system adaptive. Rosenau (1998) and Walby (2003) identify four main elements of complexity theory relevant to the social sciences: self-organization and emergent properties, adaptation and co-evolution, the power of small events, and sensitivity to initial conditions. Self-organization refers to a network of processes in which each component within a system participates in the production or transformation of other components — this process is referred to by its biological term autopoiesis. A system's emergent properties (the behaviour of the systems is determined by the nature of the interactions between agents) defines the relationship between different system levels. Here each level contains the objects that are present in the other levels, but can also be analyzed differently (Walby 2003). The behaviour of the system cannot be predicted from an inspection of its individual components.

Furthermore, there is no assumption of a presumed hierarchy between inter-connected phenomena. Social scientists have often over-stated the extent to which systems are nested in a hierarchical fashion. Systems interact with each other and co-evolve simultaneously (Jervis 1997). Each system takes all other systems as its environment (landscape or fitness landscape). As one system evolves, it changes the landscape for others, changing their opportunities. (Walby 2003). Systems exchange information with their environment but operate in conditions far from equilibrium. The impacts from the system may be indirect or experience time lags.

The study of policy process frameworks has much to gain from the concepts and epistemology derived from complexity theory. In Figure 3-4, four different policy making systems can be identified: national policy domain, provincial policy domain, policy community, and a hetearchical level. However, each individual organization (policy actor), should be considered as a unique fifth system of its own. The environment (fitness landscape) of the policy community (system) would be comprised of the other four systems, which remain interconnected but in a less hierarchal and nested fashion. Each policy-making system (level) is comprised of a host of government and societal organizations (systems unto themselves).

Complementing complexity theory is fuzzy theory. Whereas the former provides a new way of thinking, fuzzy theory can be used as tool. Past research using the above policy frameworks have developed purposely-developed discrete or 'crisp' boundaries that neatly define those participating policy actors within a particular policy community or policy network. In the case of the ACF, competing policy actors adhere to several well-developed and coherent policy belief structures. However, when situated within a complex system, there, in fact, exist a number of interconnected policy making systems defined by their non-linear relationships to one another. This non-linearity may be the result of the diverse issues addressed within each system or the unique composition of policy actors. Concepts such as policy actors, policy communities, and advocacy coalitions may, in fact, become more abstract and difficult to define.

In 1965 Lotfi Zadeh's landmark paper on fuzzy sets introduced the concept of "unsharp" boundaries. This paper marked the beginning of a new research direction contributing to behaviour in complex systems. A set is fuzzy when items can belong partially to it, rather than belonging either totally or not at all, criteria which belongs to boolean logic. In boolean (crisp) sets, the membership is binary (1 or 0, true or false). Zadeh (1965) argued that ambiguity is entirely separate from fuzziness. Fuzziness is a precise type of vagueness, having to do with graduations in categories. Thus it permits a type of imprecision, characterizing classes, which, for various reasons, cannot have or do not have sharply defined boundaries.

Ragin (2000) argued that fuzzy-set theory extends the dialogue between ideas and evidence in social research.[25] Cioffi-Revilla (1981) stated that fuzziness is everywhere in political science. For example, countries can be assessed and

[25] Fuzzy theory has been widely used in the social sciences. For a comprehensive review see Smithson (1982; 1987).

compared in terms of their respective levels of democracy. The same can be said for policy process models. For example, depending on their capacities and competencies, some organizations will contribute more than others on particular issues. Organizations may be more engaged at one level than another. In elaborating upon the complexity framework below, fuzziness plays a critical role.[26]

In many of the social science disciplines, application of complexity theory has flourished (Geyer *el al.* 2005). However, its foothold in politics and policy studies remains underdeveloped. There are two notable political science contributions that warrant further elaborations: the punctuated equilibrium model of policy change and stability and a holographic conception of organizational design and function. The punctuated equilibrium model developed by Baumgartner and Jones (1993) attempts to explain why the policy process moves between periods of stability and infrequent periods of dramatic and rapid change.[27] In most cases, policy-making follows an incremental path in which, as introduced above, policy monopolies dominate. This strongly homeostatic system generates a series of stable policy outcomes for decades (Baumgartner and Jones 2001). During times of such stability, shocks to the policy-making system are dampened by self-correcting mechanisms (negative feedback) within a policy community such as institutional structures or by powerful and stable ideas (or images). A negative feedback system never allows the political system to veer too far from an underlying equilibrium (Baumgartner and Jones 2001). On the other hand, positive feedback mechanisms often result in large and generally unexpected changes (Baumgartner and Jones 1993). In this case, a policy monopoly quickly loses its supporting ideas and rival institutions and other policy actors appear and attempt to be involved. The punctuated equilibrium model suggests a complex policy system is subject to long periods of stability characterized by incremental change (policy learning) interspersed with major upheavals causing the overhaul of policy communities.

A holographic conception of organizational design and function developed by Morgan (1986) also contributes to complexity theory and its link to policy change. The above discussion outlined why organizational capacity, competency, and commitment was an important consideration in developing a more comprehensive understanding of the policy process. Figure 3-4 describes the key organizational actors and the different policy-making environments. However, the figure fails to consider the complexity of organizational dynamics. Morgan employs holographic[28] analogies to describe complex organizations. There are four principles, namely redundancy of functions, requisite variety, minimum critical specification, and "learning to learn." The redundancy of functions refers to extra functions being added to a system so that each part is able to engage in a range of functions rather than just perform a single specialized activity. Thus the capacities relevant for the functions of the whole are built into the parts. Requisite variety describes how

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[26] Recently, Reynolds *et al.* (2003) applied fuzzy logic was applied to a forest policy context in the assessment of temperate and boreal forest sustainability using the Montreal Criteria and Indicators

[27] Johns (2003) uses evolutionary theory to explain policy change. Kangas and Kangas (2004) examined forest related vulnerability and risk using fuzzy logic.

[28] Holography is he condition upon which the information for creating a whole system is stored in each of its parts.

redundant functions of an organization are actually applied in light of its environment. Morgan argues that organizations cope better when a number individuals responsible for certain tasks have aquired overlapping skills. Minimum critical specification suggests that organizations should build in internal flexibility and enabling conditions, which allow a system to finds its own form. Finally, "learning to learn" refers to the ongoing development of norms and behaviours that will guide activities. Morgan readily admits that very few organizations are truly holographic, those organizations that adopt these traits are more likely to adapt in an increasingly complex environment.

The most systematic attempt to apply complexity theory by a political scientist is Geyer's (2003) framework that seeks to examine several pressing large scale contemporary political phenomena, namely European Union (EU) integration, the role of the British state, and major domestic policy areas such as health and social welfare. The framework, which is based upon a paradigm of order, leads to phenomena demonstrating a variety of complex attributes ranging from linear to alinear. In Figure 3-5, systems can exhibit a great deal of disorder, such as quantum mechanics in the physical sciences or random events within the social world. Linear systems, on the other hand, are predictable, deterministic, and apt to reductionism: gravity is one such example. Although linear assumptions have dominated the social sciences, many events fall within the non-linear range. Geyer (2003) borrowed natural science concepts to describe this range of complexity (Figure 3-5 and Figure 3-6). Closest to the linearity is biotic complexity, which describes systems that obey fundamental physical laws but are complex (numerous internal elements), dynamic (governed by local interactions between elements) and dissipative (consume energy to maintain stable pattern) (Geyer 2003). Geyer (2003) described fundamental attributes that characterize complex systems (Figure 3-6). Abiotic systems include partial order (phenomena can exhibit both orderly and chaotic behaviours), reductionism and holism (some phenomena are reducible while others are not), and predictability and uncertainty (phenomena can be partially modeled, predicted, and controlled). Moving even further from linearity is a biotic complex system. Biotic systems have an additional attribute: emergence properties. Shifting from the natural sciences to the social sciences, Geyer (2003) introduced conscious complexity. Here, interpretation (where actors are aware of themselves, the system and their history) plays a role alongside the other attributes listed in Figure 6.

A range of complexity dynamics (alinearity, conscious complexity, biotic complexity, abiotic complexity, and linearity) is illustrated in Figure 3-7. In each case, different types of complex phenomena coexist and provide a number of outcomes. For example, in large policy areas such as the National Health Service (NHS) in the UK, Geyer found that the Labour government was treating it as a "linear mechanism that could be controlled by centrally directed, hierarchical, command and control procedures" (Geyer 2003). However, the NHS's ability to function is not due

to direct actions of the government policy but as a result of a complex self-organizing adaptive system.

Figure 3-5. The Range of complexity dynamics in physical and human phenomena

DISORDER ← → ORDER				
Alinearity	Conscious Complexity	Biotic Complexity	Abiotic Complexity	Linearity
	Range of non-linear systems			
Examples from the physical sciences				
Aspects of quantum mechanics and light	N/A	Plant/animal interaction	Fluid dynamics and weather patterns	Gravity Motion in a vacuum
Examples from the social sciences				
Random events, dreams, the unconscious	Norms, values, language, narrative interpretation	Group dynamics, institutional processes	Crowd dynamics, electoral outcomes, economic laws	Basic constitutional laws

(Adapted from Geyer *et al.* 2005, pp. 33-55)

Figure 3-6. Attributes of non-linear systems

System of complexity			Attributes
Abiotic complexity	Biotic complexity	Conscious complexity	Partial order
			Reductionism and Holism
			Predictability and Uncertainty
			Probabilistic
			Emergence
			Interpretation

(Adapted from Geyer *et al.* 2005, pp. 33-55)

Figure 3-7. The range of complexity dynamics in political phenomena

DISORDER ORDER ◄——————————————————————————————►				
Alinearity	Conscious Complexity	Biotic Complexity	Abiotic Complexity	Linearity
	Range of non-linear systems			
Range of International Arena Phenomena				
Long-term development Next world system	Nationalism and internationalism	State and non-state interaction Institutional interaction	Voting outcomes in the various international institutions	Basis framework and power relationships
Range of European Union Phenomena				
EU long term development	European citizenship Policy implementation	Member state interaction EU institutional interaction	Voting outcomes in the various EU institutions	Core short-term framework
Range of UK Welfare state (and National Health Service) Phenomena				
Long-term development of the UK welfare state/NHS	The meaning of welfare (health) and its interpretation	Interaction between core institutional actors	Basic decisions over resource allocation	Core short-term framework and basic resource allocation

(Adapted from Geyer *et al.* 2005, pp. 33-55)

Complexity-based policy process framework

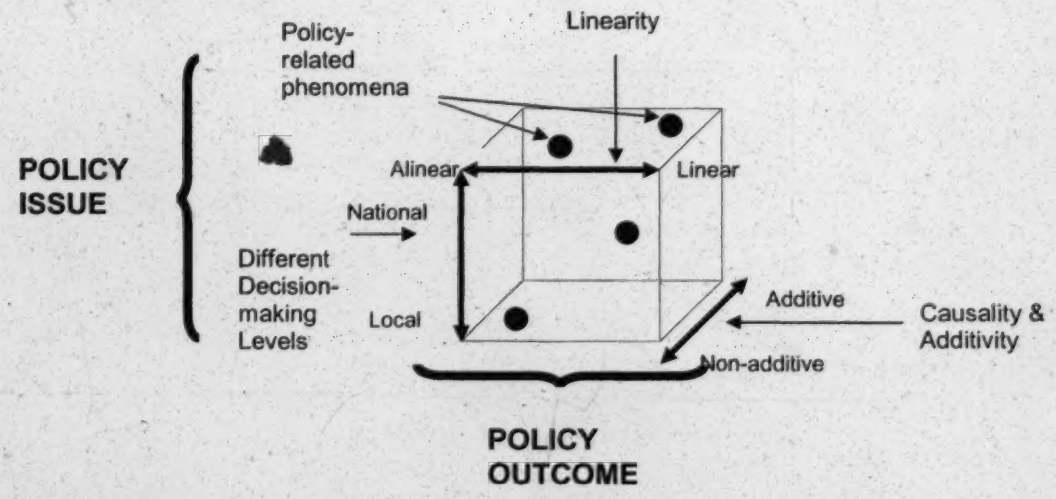
Geyer's complexity framework introduces the concept of order and the ranges of linearity that characterize general political phenomena. A number of necessary amendments are made to this framework, thus permitting policy frameworks to be examined within the context of both complexity theory and fuzzy logic theory. The first change is the role of the role of causal complexity. Causality is particularly important when determining policy outcomes resulting from the interaction of phenomena at different decision-making levels. Causal complexity describes a process in which the effect of one variable or characteristic can depend on the presence of other characteristics or a process in which the outcomes results from several different combinations of conditions (Ragin 1987; Jervis 1997; Braumoeller 2003). Braumoeller (2003) describes different types of complex causality such as multiple conjunctural causation (where X_1 and X_2 and X_3 produce Y), substitutability (where X_1 or X_2 or X_3 produces Y), contexts (where X_2 produces Y, but only in the presence of X_1), necessary and sufficient conditions (where X_1 and X_2 produce Y, X_1 and X_2 produces Y), and INUS conditions[29] (where (X_1 and X_2) or (X_3 and X_4) produce Y). Causal complexity can be further complicated by non-additivity, which can result from the cumulation of the impact of independent variables on the

[29] INUS conditions according to Mackie (1965) refers to an insufficient but necessary part of a condition which is itself unnecessary but sufficient for the result.

dependent variable Braumoeller (2003).[30] Or a different combination of conditions may produce the same outcome (Ragin 2000).

In Figure 3-8 below, the three main components (additivity, different decision-making levels, and linearity) that define complex policy making systems are illustrated. Thus political-policy related phenomena, as described by Geyer (2003) above, can range from linear to alinear in their attributes. Policy outcomes (dependent variables) occur as the result of the interaction of a host of different independent variables. Furthermore, the role of policy issues is also addressed in this framework. Each particular issue will lead to the identification of issue-specific policy related phenomena as the causal drivers of policy change. Thus, there will be a number of complexity-based policy frameworks employed that correspond to particular issue areas.

Figure 3-8. Main components of a complexity-based policy process framework



In Figure 3-9, a complexity-based policy process framework is developed and then elaborated upon in Figures 3-10 and 3-11. This framework makes a number of significant modifications from Geyer's original framework. In part, these changes reflect the gaps originally identified at the outset of this chapter, namely the interaction of policy-making levels, role of organizations, and the inclusion of power and state sovereignty. Further modifications were made to enhance the complexity-based assumptions made in Geyer's original model in order to address causality. A complexity policy framework also borrows from Hofferbert's (1974) "funnel of causality" that illustates the indirect and direct role of historical, geographical,

[30] Non-additivity describes a relation when the addition of the separate effects does not add up to the total effect.

cultural, and institutional phenomena as well as elite decisions in developing policy outcomes (Hofferbert's funnel of causality diagram is illustrate Appendix A). Hofferbert's model clarifies the scope of political phenomena necessary to a policy framework.

In Figure 3-9, a skeleton of the framework is presented to illustrate its main features. Figures 3-10 and 3-11 then present a forestry policy example, the Mountain Pine Beetle epidemic. The most notable departure from Geyer's framework is the inclusion of multiple levels of decision-making. All four levels highlighted in Figure 3-4 (national policy domain, provincial policy domain, policy community, and heterarchic level) are simultaneously illustrated in Figure 3.9.

Organizations are also illustrated in Figure 3-9. Figure 3-9 explains how every organization's response will vary, depending upon the decision-making level, the issue, and its internal capacity, commitment, and competencies. As a result, organizations A_1 through organization A_i represent all organizations throughout the policy universe. This list of organizations is duplicated at every level. Thus, organization A_{23} may be a federal central agency (e.g. Treasury Board) and exhibit considerable influence and power at the national domain level, but due to its competencies and commitment, its response at the provincial forest policy community level may be minimal to none. Changes within an organization may also lead to a changing role within a level. Thus, changes to leadership within organization A_{45}, a provincial natural resource department, may result in a different response in terms of its policy-making at the policy networks and its deployment of its scientists at the heterachic networks. The two-headed arrow represents the impact that each particular phenomena (e.g., event, issue, institution) along the complexity continuum will have on each organization and the impact of each organization upon the respective level. The tooth shaped line separating the organizations and the different levels represents the fuzziness of these impacts.

Another modification made is a consideration of causality. Whereas $X_1 \ldots X_{16}$ denote independent variables within the framework, policy change that leads to the eventual policy outcome (Y) (dependent variable) may be subject to the different types of causality (e.g., multiple conjunctural causation, substitutability). In Figure 3-9, the independent variables examined as part of a hypothetical causal relationship are circled (X_1, X_7, and X_{14}). Furthermore, the interactions of independent variables will inevitability lead to non-additivity within many complex causal relationships.

In Figure 3-10, examples typical of Canadian forest-related policy phenomena are presented. Within each level, different phenomenon is located according to its range of linear complexity -- from the linear features of the Westminster parliamentary system to the alinear complexities of Canadian federalism at the national domain, or the uncertainty of the Mountain Pine Beetle epidemic outbreak in British Columbia's southern interior to the basic linear physical features of forest ecosystems. Figure 3-10 also includes the components of the policy process

frameworks (policy communities, policy networks, policy oriented beliefs) described earlier in this chapter. These frameworks are also subject to different ranges of complexity. For example, a policy network may be a concertation network between a provincial government department and the forest industry, or it may be a highly complex cliental pluralist network in which power is dispersed among many different and competing policy actors. Policy core beliefs may exhibit varying degrees of complexity, ranging from simple business interests to multi-faceted beliefs. Policy related phenomena become dynamic and can shift across the causal continuum described in Figure 3-10.

Fuzzy logic plays an integral role in understanding the temporal changes occurring within complexity policy frameworks. Phenomena, as illustrated in Figure 3-11 and 3-12, will shift across the permeable boundaries of different types of complexity. There are two ways in which fuzzy logic can be applied. First, the continuum from linearity and alinear is fuzzy and its range is dependent upon graduations of categories. Figure 3-6 provides these categories (partial order, reductionism and holism, predictability and uncertainty, probabilistic, emergence, and interpretation) important in a complexity-based policy-making framework. Second, a temporal change that results in shift in phenomena along the continuum reveals that phenomena themselves have fuzzy properties and are subject to different types of complexity.

A forest-based issue case study: the Mountain Pine Beetle

Selected independent variables are identified in a hypothetical example reflecting a current and pressing policy issue: British Columbia's Mountain Pine Beetle outbreak. Mountain pine beetles (*Dendroctonus ponderosae)* thrive on mature lodgepole pine (*Pinus contorta* var. *latifolia*). Since 1994, British Columbia's interior region has experienced a number of mild winters, leading to a decrease in beetle larvae morality from 80% to less than 10% (British Columbia 2003). Climate data for the region indicates that the average annual temperature has increased by 2.2°C to 2.6°C over the past 100 years. Furthermore, climate models project that this warming trend will continue (British Columbia Ministry of Water, Lands, and Air Protection 2002). This area also has an abundance of mature lodge pole trees acting as an ideal environment for large beetle colonies. In 2003, an estimated 4.2 million hectares were attacked and 160 million m^3 of timber affected. This epidemic has claimed an increasing number of trees: 160,000 hectares in 1999, 284,041 in 2000, 785,497 hectares in 2001, and 1,968,641 hectares in 2002 (British Columbia 2003).

In Figure 3-10, the following policy-related phenomena are identified as possible drivers of policy change: the Mountain Pine Beetle (MPB) outbreaks (X_1), longer term impacts of climate change (X_2), public opinion (X_3), policy oriented beliefs (X_4), policy networks (X_5), exports and timber supply (X_6), executive and interstate federalism (X_7), forest dependent communities (X_8), and policy learning

and the role of science (X_9). These are examined in order to demonstrate policy change and an outcome in British Columbia's forest policy (Y). An example of Y in this case could be the *Mountain Pine Beetle Emergency Response – Canada-B.C. Implementation Strategy*, which provided $100 million over three years for the development and implementation of programs that sought to reduce the spread of the beetle, the protection of fish streams and rivers at risk, fuel management on lands surrounding high-risk communities, and the development of additional markets for the large volumes of salvaged timber (British Columbia 2005, p.1).

Figure 3-10 illustrates British Columbia's forest policy community in 1997 (T_1) prior to the MPB outbreak when less than 10,000 hectares were affected on an annual basis. In this case, there is no policy outcome (Y) relating to MPB. The existence of the beetle was known locally and small outbreaks were researched by federal and provincial government entomologists (X_9). The BC forest policy community was polarized: one was a dominant industry-provincial government based advocacy coalition and the other was a growing environmental. This example reveals that policy change through policy learning between competing coalitions is difficult because of the high level of conflict and disagreement of core-policy beliefs regarding forest management practices.

A temporal consideration is a necessary feature of a policy-based complexity framework. Figure 3-11 illustrates the same political phenomena identified in Figure 3-10 but in 2000 (T_2). In T_2 there are shifts in the location of policy-related phenomena, which may be subject to different causal assumptions that existed in T_1. The arrows indicate a shift in both the decision-making focus and in changing complexity facing the policy-related phenomena. A massive outbreak of the beetles throughout British Columbia's southern interior (X_1) resulted in this phenomena becoming an issue extending beyond British Columbia's forest policy community but also included the provincial and national policy domains. Furthermore, the phenomena of long term climate change impacts (X_2) became better known and thereby demonstrated that the series of consecutive warm winters may have contributed to the beetle's outbreak. The economic well-being of forest dependent communities (X_5) became as important to the provincial making domain as halting the epidemic's spread. Also, the provincial domain was impacted by negative public opinion (X_3) of the widespread beetle damage. Exports and timber supply (X_6) shifted along the complexity continuum due to the uncertainty caused by the loss of timber ($20 billion timber value) combined with the difficulties resulting from the softwood lumber dispute. Executive and interstate federalism (X_7) cannot be overlooked. The B.C. Premier, Gordon Campbell, directly appealed to the Federal government for emergency funding and the establishment of the *Mountain Pine Beetle Action Plan* in late 2001 (British Columbia 2003). The possibility of policy learning and the development of a MPB policy network (X5) emerged in the form of the Minister's Community Advisory Group that consisted of First Nations, the forest

industry, academia, logging contractors, environmental groups, and the federal government (British Columbia 2004). The role of science (X_9) and policy learning can be highlighted by the debate that emerged over the issue of the extent of salvage logging infected areas. Finally, core policy beliefs (X_4) and policy direction of the dominant industrial-provincial advocacy coalition may be challenged because of an exogenous impact upon British Columbia's forest policy community.

This case study presents a preliminary sketch of a possible policy-process framework that accounts for a host of factors: the role of organizations, multiple decision making levels, various issues, power, causality, and one that can capture a wide range of policy phenomena. The above policy complexity framework is presented as metaphorical description of a key policy issue where causality was implied. A reliance on metaphorical framework represents a crucial juncture in considering the empirical application of complexity theory and fuzzy logic.

Figure 3-9. The range of complexity dynamics in policy making

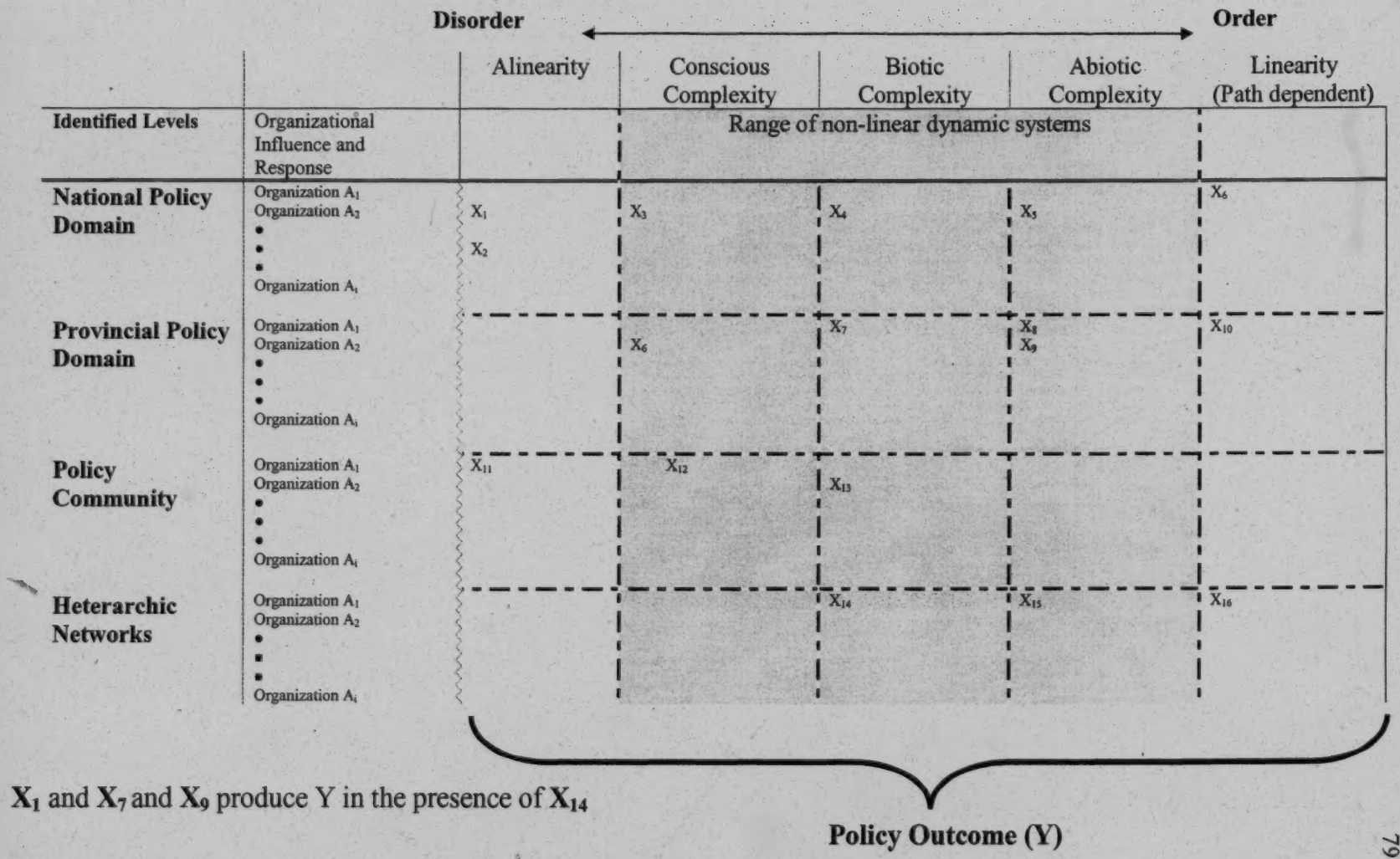


Figure 3-10. Range of complexity dynamics in forest policy making (T_1)

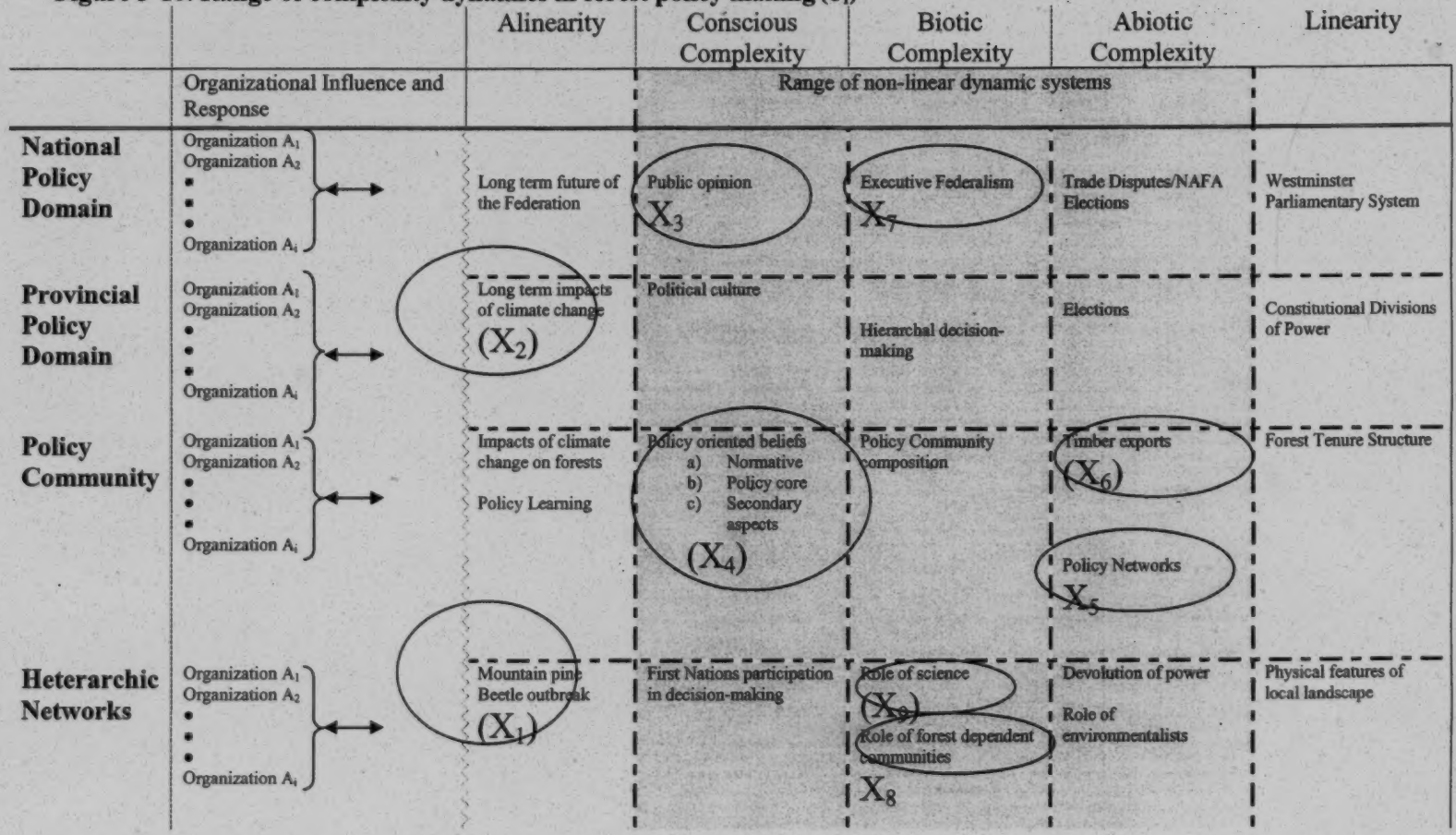
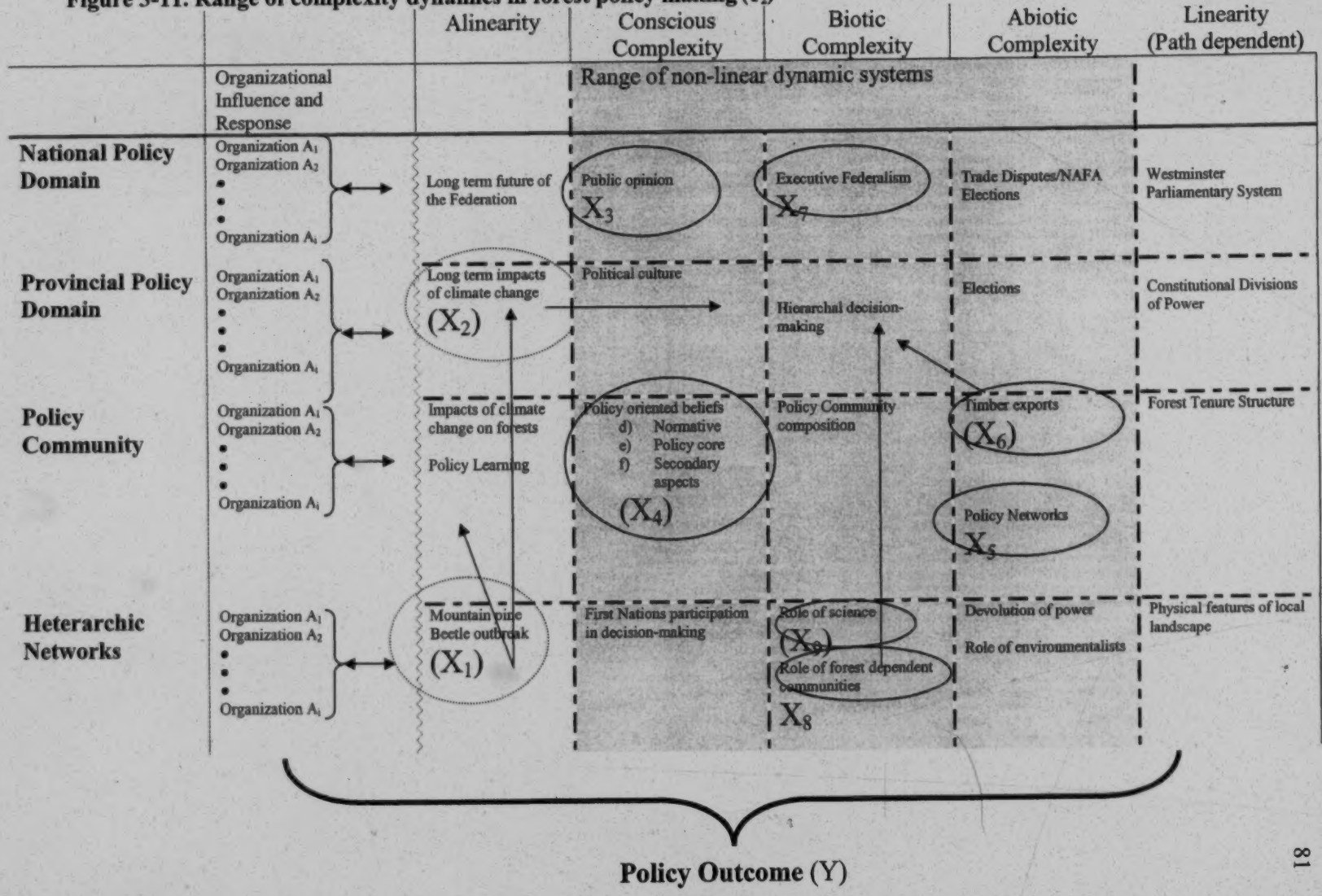


Figure 3-11. Range of complexity dynamics in forest policy making (T_2)



Concluding remarks

Implications for policy research

The complexity-based policy framework introduced in this chapter is a theoretical response to a number of serious shortcomings within current policy based research; these include the incomplete conception of policy-making organizations, the role of multiple decision-making levels, the absence of power, and linear-based biases within popular policy process frameworks. Complexity theory and fuzzy logic concepts can aid policy researchers in developing more a timely understanding of policy change in light of changes to governance resulting from the shifting focus of capitalist states. Policy research, therefore, simply cannot afford to neglect these important considerations.

The changing capacity, competency, and commitment of organizations in a dynamic multiple level decision-making structure will have a considerable impact on policy research. The same organizations will be prevalent at various different levels. These challenges will require researchers to consider how particular organizations function internally as an important determinant of policy outcomes. As the nature of governance in policy making changes, successful organizations may adapt to complexity by taking on the holographic features and functions described by Morgan (1986).

Finally, the role of power cannot be overlooked. Previously, the closed network between the forest industry and provincial forestry agencies defined the key source of power within forest communities. However, this narrow view of power has been expanded and with power relationships from above (international organizations) and from below (the emergence heterarchic networks) to alter the direction of forest policy-making.

Critical introspective on future research directions[31]

Throughout this process of introducing new theoretical modifications to the policy literature, considerable 'messiness' was also created in terms of the possible unpacking of observed empirical aspects within a complexity-based policy process framework. The MPB case study illustrated that there are potentially many variables and complex causal relationships that could be encountered when undertaking an empirical-based study—particularly a study that seeks to make inferences about political phenomena. An enhanced level of theoretical sophistication must also be balanced and met with levels of corresponding research rigor in empirical undertakings. These requirements are necessary if a comparative research agenda is sought. A number of theoretical-empirical bridging challenges were encountered in this chapter.

The first empirical challenge is determining the location of political phenomena on the linear-alinear order continuum. Although fuzzy logic may provide some latitude in this respect, a greater deal of precision is required in justifying where

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[31] I would like to acknowledge the feedback and insights received during the presentation of the ideas developed in this chapter at the Complexity, Science, and Society conference held at the University of Liverpool, Liverpool, UK (September 11-14, 2005) in developing this section.

specific political phenomena initially fit along the continuum. As highlighted in the previous section, the temporal features of the policy-making complexity framework permitted a shifting of phenomena from one type of complexity to another. However, to suffice an empirical study, the attributes of non-linear systems (see Figure 3-6) (partial order, reductionism and holism, predictability, probability, emergence, and interpretation) need to be interpretable to an empirical study. For example, what were the determinants that led public opinion to be considered under the category of conscious complexity? How can this particular variable be operationalized?

A second challenge is fully explaining and justifying the shift of phenomena between different decision-making levels and/or different complexities. Although the causal arrows imply a dynamic framework, very little is understood about the shift itself. As a result, the frameworks presented in this chapter continue to be largely structural and static.

The third empirical challenge is determining what variables (or phenomena) should be included within complexity based policy frameworks and how they should be analyzed. Geyer *et al.* (2005) suggest adopting a variety of methods ranging from statistical to historical narratives and are dependent upon the complexity of the phenomena under investigation. However, this strategy becomes somewhat problematic because of the temporal mobility of variables between decision-making levels or between different types of complexity.

Although the theoretical contributions made in this chapter are noteworthy, there continues the danger that if the empirical applicability remains unaddressed then complexity theory and fuzzy logic theory will simply contribute to an unfilled and unhelpful exercise of 'theorizing for the sake of theorizing.' That is, if the gap between theory and its empirical applicability cannot be bridged, a complexity/fuzzy logic inspired framework has to be abandoned. Such a decision is well beyond the scope of this chapter; instead a starting point is considering the tools and techniques for understanding complex phenomena including 'weak metaphors,' 'strong metaphors,' and mathematics (Eoyang 2004). Weak metaphors, patterns or structures derived from complexity science, form the backbone of the policy community/network literature and are applied in many Canadian case-studies. Strong metaphors, namely the application of tools derived from complexity (such as a coupling and computer simulation models), and mathematical approaches attempt to represent complex relationships among variables (such as network analysis and nonlinear time series modeling) (Eoyang 2004). Currently there is considerable empirical complexity-based research underway in other areas such as economics, education, and computer science, which may open avenues in policy research.

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Chapter 4 - COORDINATING FUTURE CLIMATE CHANGE POLICIES IN THE CANADIAN PRAIRIE AGRICULTURE, FORESTRY, AND WATER SECTORS

Introduction

An important, yet little researched, area within the policy sciences is the study of theoretical and empirical understandings of how new policies will evolve from emerging issues. This chapter investigates the relationships between the concerns for climate change (an emerging issue), policy-related beliefs and informal coordination networks of policy elites in three Canadian Prairie Provinces (Manitoba, Saskatchewan, and Alberta). Policy beliefs and informal networks serve as useful indicators of future policy directions—particularly within a nascent policy area such as climate change. Moreover, in Canada, in the absence of formalized policy debate, such as that found in U.S. Congressional hearings, the interaction between policy elites is difficult to ascertain. This chapter addresses a number of questions regarding policy beliefs and informal networks.

1. What is the structure of natural resource based informal networks and policy beliefs?
2. How do informal networks interact with each other?
3. Which are likely to have more impact on the climate change issue: policy oriented beliefs or informal networks?
4. What is the potential for climate change policies to emerge from the Canadian prairie agriculture, forest, and water sectors?

This chapter answers these questions by posing a number of testable hypotheses that examine relationships between key organizational clusters (federal government, provincial government, the agriculture and forest industry, and environmental and research-based organizations) in terms of their informal networks and and policy-oriented beliefs.

Outline

The first section provides a background of the Canadian climate change issue. This is followed by a literature review of informal networks and policy oriented belief systems. The next section describes the online internet survey instrument, the data collected, and structural equation modelling. The results section presents a comparison of mean scores using ANOVA and Dunnett's C tests for heterogeneity of the respondent's policy belief structures. A structural equation model (using the LISREL computer program) is developed and then used to describe the relationships between broad organizational coalitions, networks of coordination, and the concern for climate change.[32] Finally, these results are discussed within the context of

[32] Three different informal coordination network variables were initially considered. The networks included those: 1. Where respondents relied heavily on other organizations for policy viewpoints, as a source of valid information, and innovative ideas; 2. Where respondents thought other organizations have a lot of power; 3. Where respondents thought that other organizations were regarded as allies

contributions to policy science. Furthermore, the relevance to future climate change policy directions in Canada is also explored.

Background – Climate change in Canada

Climate change related impacts such as drought, fire, and flooding upon vulnerable ecosystems throughout the world have received considerable attention by the scientific community, international organizations, the media, and national governments. In Canada, events such as the 1997 Ontario-Quebec ice storm, the 1997 Red River flood in Manitoba, and a five-year drought on the prairies (1998-2002) have only amplified these concerns (Canada 2003a). Scientists have identified the Canadian Prairie Provinces and the U.S. Great Plains states as being particularly vulnerable areas in North America (International Panel on Climate Change 2001).

Responding to these concerns, Canada's Standing Senate Committee on Agriculture and Forestry sought to investigate the current levels of knowledge related to climate changes by consulting experts and scientists representing three particularly vulnerable sectors: agriculture, forestry, and water. In its final report, *We are at Risk*, the Committee concluded with a number of recommendations; they included the creation of climate-specific policies, the integration of climate into existing programs such as farm income safety nets, and 'No-regret' public policies (Canada 2003a). An increased level of communication, including exchanges of information between sectors, between different levels of government (federal, provincial, and local), and between government and non-government organizations (such as industry, environmental and conservation groups, and universities) was raised as a critical component of effective long-term climate change policy solutions.

Shortly after agreeing to the 1987 Kyoto Protocol, the international commitment to reduce greenhouse gas emissions, the 1998 Federal budget announced a three-year $150 million Climate Change Action Fund (CCAF) (Canada 2003b). This broad program, coordinated by Environment Canada and Natural Resources Canada, sought to investigate the Kyoto Protocol mechanisms, develop new technologies, enhance public education, investigate impacts and adaptation, and consider policy options. Another part of the Federal response was the formation of the National Climate Change Secretariat, also in 1998. The Secretariat, comprised of representatives from federal and provincial/territorial governments, was given the task of investigating climate change related issues in sixteen different areas.[33] The sixteen Tables/Working Groups, comprised of 450 experts from government, industry, academia, and non-governmental organizations, examined and analyzed the impacts, costs, and benefits of options to address climate change. From this

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(based upon the willingness to share information, develop joint policy positions, and voluntarily modify their own organization's behaviour). This chapter investigates the role of ally-based informal coordination networks. This model was chosen over the other two because it presents action-based constructs compared to perceptual constructs about organizations for the other two models. This chapter seeks to examine the likelihood of network building an action in the development of climate change related policies.

[33] The 16 Tables included: agriculture and agri-food, analysis and modelling, buildings, credit for early action, electricity, enhanced voluntary action, forest sector, industry, Kyoto mechanisms, municipalities, public education and outreach, science, impacts and adaptation, sinks (carbon sequestration), technology, tradeable permits working group, and transportation.

organized, coordinated research effort, the Joint Ministers of Energy and Environment announced plans for the National Implementation Strategy on Climate Change and the First National Climate Change Business Plan in 2000. Integral to the strategy and business plan was the $1.1 billion *Government of Canada Action Plan 2000 on Climate Change*. Clearly, since 1997, Canada's federal government has led domestic efforts in developing climate change science and the initiation of broad strategies. All of the provincial and territorial governments responded to the *Action Plan* by initiating climate change initiatives and plans of their own. For example, the Alberta government released its own provincially tailored Climate Change Action Plan, *Taking Action*, whereas the Manitoba government's *Kyoto and Beyond: Manitoba's Climate Change Action Plan* was launched in 2002 (Alberta 2002; Manitoba 2002). A similar array of broad proposed activities ranging from investment in energy efficient programs, enhanced levels of research, technological development, and increasing public awareness were indicated in both documents. Environmental organizations (such as the Sierra Club of Canada) have also developed climate change strategies whereas climate change based research organizations and networks have emerged (such as the Canadian Climate Impacts and Adaptation Research Network) (Canada 2003c).

This brief overview demonstrates that climate change occupies an important position on the Canadian federal government's policy agenda. However, these actions only constitute an elaborate policy problem identification exercise. Very little has been undertaken in terms of formulating and implementing specific climate change public policies. In fact, all of the strategies developed to date state that climate change issues are complex and have such a wide scope that successful policy outcomes will only materialize if there is cooperation across sectors and between different organizations. However, it is difficult to assess the potential for such cooperation, as well as the sources of opposition to climate change within the Canadian policy making landscape, is difficult to assess. Two sources of cooperation and opposition to policy change are considered in the literature review below. The first examines loosely formed nonfigurative networks, the second examines the role that policy-oriented beliefs play in providing long term support for climate change.

Literature review - Sources of policy change: Informal coordination networks, oppositional structures, and policy oriented beliefs

Chisholm's (1989) study of the San Francisco Bay area transit system attempted to explain how a complex multi-organizational loosely coupled system functioned without any formal hierarchal structure. He found that organizations within complex systems often informally coordinate with each other in order to manage environmental uncertainties and inter-organizational interdependence. From his interviews of senior Bay Area transportation officials, Chisholm (1989) measured the pattern of informal channels between different organizations. From the characteristics of relationships between individuals, he found that a number of

informal networks emerged. For example, informal networks were centred on operational, planning, and management aspects of the transit's system were identified.

Zafonte and Sabatier (1998) employed Chisholm's (1989) approach to informal coordination and interdependencies within a policy context. Whereas Chisholm asked his respondents to directly identify specific individuals within organization, Zafonte and Sabatier (1998) employed indirect measures of identifying informal coordination. However, they were confident that these measures accurately reflected an individual's interpretation of past actions of a particular organization. They sought to examine the link between policy oriented beliefs (discussed below) and informal networks in their study of water policy-making in San Francisco Bay-Delta watershed area. In their survey of the area's policy elite, they defined informal coordination channels, asking respondents to identify other organizations involved in the San Francisco Bay-Delta in terms of who they considered be allies, who they perceived as having power, and whether an identified organization was considered as a source of valid information.

Zafonte and Sabatier's (1998) study was a response to Schlager (1995) and Schlager and Blomquist's (1996) criticisms that organizational coalitions may hold a particular unified belief structure, but they may not act in concert. Zafonte and Sabatier (1998) hypothesized "that overlapping functions induce interactions between organizations and individuals who share similar beliefs," and that they will result in a greater frequency of coordination (Zafonte and Sabatier 1998. p. 481). The role of policy oriented beliefs has been well chronicled, particularly by Sabatier and Jenkins-Smith (1993, 1999). They developed the advocacy coalition framework (ACF) in order to understand policy change over a long period of time (greater than 10 years). The ACF is founded on the argument that policy change is the result of exogenous events outside of policy sectors (e.g., changes to governments or because of endogenous changes such as policy learning from within policy communities)[34]. Policy learning refers to the "relatively enduring alternations of thought or behavioural intentions that result from experience and/or new information and that are concerned with the attainment or revision of policy objectives" (Sabatier and Jenkins-Smith 1999, p.102).

Previous ACF empirical applications have found that within nearly every policy community there are organizational elites who identify with a particular coalition. Within a policy community there are usually two or three advocacy coalitions that are each defined by a unique hierarchal belief structure comprised of the deep normative core, a policy core, and secondary aspects. The deep normative beliefs are universally held; however, core beliefs are more specific within a particular policy community. Deep normative beliefs address the most fundamental economic, political, or social issues. (e.g., the basic criteria for distributive justice or the relative priority of various key values). The policy core beliefs relate to those key policy positions and basic strategies for achieving them. For example, Wellstead

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[34] Policy communities are defined as the structural configuration of the policy actors who participate in the policy process within a particular sector. They include all actors or potential actors with a direct or indirect interest, common policy focus, and with varying degrees of influence shape policy outcomes over the long run (See Pross 1986 and Coleman and Skogstad 1990).

(1996) found that the forest tenure system defined the dominant industrial advocacy coalition's belief structure in the Canadian provinces of Alberta and Ontario.[35] Secondary beliefs are the instrumental decisions required to implement the policy core and reflect the mobilization of information analysis (Sabatier and Jenkins-Smith 1999). Secondary aspects are the easiest to change, and such change usually originates from within the policy community itself through policy learning. This aspect of the ACF is the subject of considerable interest, but it is difficult to empirically measure. Policy learning can occur within and across coalitions (Lindquist 1992). Policy learning is more likely when there exists an intermediate level of conflict or debate, actors who have the proper technical resources to engage in such debate, and forums prestigious enough to attract professionals to participate and that are dominated by professional norms (Jenkins-Smith 1988). Policy learning may prove to be an important aspect of climate change related policy change. However, policy learning may be difficult to initiate in the absence of a coordinated channels between policy elites. While Chisholm, and Zafonte and Sabatier examined cooperation between informal networks, the role of opposition and conflict is an important research aspect that is not discussed.

This chapter also highlights the role of oppositional structures between networks in climate change policy coordination. Laumann and Marsden (1979) examine overlapping configurations of policy elites. Their network approach proposes six elementary units for the analysis of political conflict: cliques, social circles, quasi-groups, action sets, factions, and coalitions. Of these, social circles, a term proposed by Kadushin (1968), permits further elaboration of Chisholm's informal coordination concept.[36] Social circles require that members be "sociometrically linked with one another, but does not require that all pairs of members be directly linked" (Laumann and Marsden 1979 ,p. 715). More importantly, Kadushin (1968) states that social circles have no clearly defined goals or outcome preferences; instead there are vague expressions of concern about a certain issue. Without a clear boundary or formal leadership, these loose networks have 'structural holes' that define the lack of ties between members. Finally, Kadushin (2002) highlights the need for network brokers to 'fill in' such holes. The social circle and informal coordination network share many similarities, in particular their non-hierarchical attributes, and therefore, appropriate to consider both terms as interchangeable.[37] Oppositional structures and political conflict, which otherwise would be absent in Chisholm's informal coordination networks are considered.

Research hypotheses

The application of the informal coordination approach, oppositional structure concept, and the ACF within prairie-based natural resource policy communities in a climate change context generated several hypotheses. The first set (Hypotheses 1-4) examines the role of informal networks and their relationship to the different

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[35] Wellstead (1996) found that both Alberta and Ontario's policy community contained two advocacy coalitions: the industrial advocacy coalition and the environment coalition.

[36] Kadushin (1968) acknowledges that his concept of social circle was derived from Simmel (1922).

[37] For the sake of consistency, the term informal coordination network will be used throughout the chapter

organizational clusters and the policy oriented beliefs whereas the second set (Hypotheses 5-8) examined more policy specific questions.

There were two notable aspects of the prairie agriculture, forestry, and water policy areas, which indicate informal networks between policy actors may play a greater role than policy beliefs in determining policy making. First, there is the state, is which an important actor within Canadian natural resource policy communities and is comprised of a few large omnibus agencies responsible for the policy-making and programs (Howlett and Rayner 1995; Hessing and Howlett 1997). Wellstead *et al.* (2004) reveal that federal or provincial government departments or agencies employed over 60% of Prairie agriculture, forestry, and water policy elites, yet they found that they were employed within only eight organizations. Furthermore, the state has been heavily involved in natural resource sectors. For example, the Crown owns over 85% of the prairie's forested lands and regulates its management (Canada 2004). Within the agriculture sector, there is a long history of providing federal and provincial agriculture producer specific programs (Skogstad 1999). The second unique aspect of prairie agriculture, forest, and water sectors is the small number of non-producer interest groups, in particular, environmental groups (Urquhart 2001). Thus,

> Hypothesis #1. *Canadian prairie agriculture, forestry, and water policy communities will be dominated by a government-based advocacy coalition.*

Hypothesis #1 is a corollary to Sabatier and Jenkins-Smith's (1999) hypothesis that government-based policy elites will advocate more moderate positions than their interest group actors. Thus, these policy communities will be dominated by a single large *moderate* advocacy coalition. However, smaller advocacy coalitions supported by diverging beliefs will be found among the industry, environmental, and research actors. In *Hypothesis #2*, the importance of federal government involvement in areas such as domestic climate change issues is reflected by all other actors (provincial government, those from environmental groups and the research community as well as those from the agriculture and forestry industry) who will consider the federal government to be a strong ally.

> *Hypothesis #2. Policy elites from governmental and societal organizations will ally themselves with the federal government.*

Similarly, policy actors are expected to provide strong support to their own informal networks.

> *Hypothesis #3 Policy elites will have a strong allegiance to informal coordination networks representing their corresponding organizations.*

The fourth hypothesis examined the potential for cooperation between ally networks,

specifically between those strongly allied to the federal government with the other three networks (provincial, industry, and environmental-research). A strong sense of allegiance between all organizations and the federal government is hypothesized above, thus, the inter-allegiance between networks, in particular with the federal government ally network should also be robust. Because the Federal government is the nucleus of Canadian climate change related strategies and funding, it should create an environment in which 'like-minded' individuals cooperate with others – in particular those who ally themselves with the Federal government. Thus there is:

> *Hypothesis #4. Those who consider industry, the provincial government, environmental groups, and/or researchers as allies will ally themselves with the federal government's informal coordination network.*

Policy beliefs, group membership, and informal ally coordination networks are compared in the final hypothesis. Following Zafonte and Sabatier's hypothesis that policy beliefs will lead to increased coordination, there is *Hypothesis #5*:

> *Hypothesis #5. Organizational beliefs will influence the support for similar organizational-based informal networks.*

Figure 4-1 provides a conceptual model illustrating the above five hypotheses. All of the paths illustrated in Figure 4-1 are later replicated in the formal structural equation model. Thus, *Hypothesis #1* examines the size of the advocacy coalitions found among the organizations within the prairie agriculture, forest, and water policy communities. *Hypothesis #2* examines the relationship between organizational membership and the extent the federal government is an ally. *Hypothesis #3* considers the relationship between formal organizational membership and the corresponding social circle identified with that organization. *Hypothesis #4* focuses on the effect from all other informal coordination networks (social circles) and the federal government informal coordination network. *Hypothesis #5* examines the relationship between the coordination networks and policy oriented beliefs.

Figure 4-1 also presents several other paths producing other hypotheses, which examine the concern for climate change and policy oriented beliefs. Hypothesis #6a and 6b consider the effect of organizational membership on concern for climate change. They infer that climate change will be more of concern for industry and environmental/research based respondents:

> *Hypothesis #6a: If a policy actor is industry-based then they will not be concerned with climate change.*
>
> *Hypothesis #6b: If a policy actor is environmental and research based policy, then it will have a greater about concern about climate change*

than all other policy actors.

It is also expected that concern for climate change will be more affected by organizational membership (which differentiates the different advocacy coalitions) than network membership.

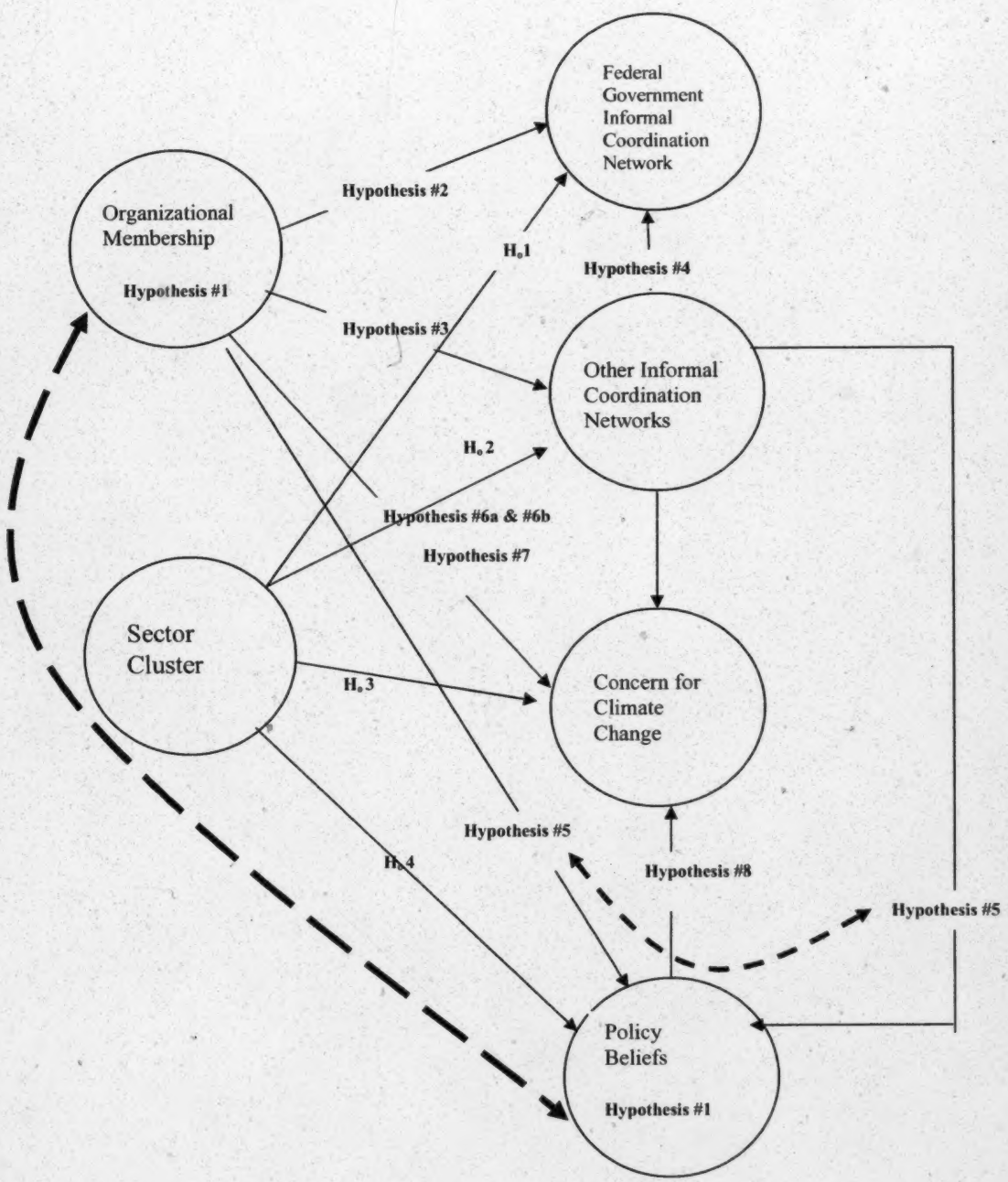
> *Hypothesis #7: Organizational memberships will demonstrate a greater concern (negative and positive respectively) for climate change than compared to the concern indicated by societal-based informal ally coordination networks (industry and environmental/research)*

Finally, a concern for climate change, a major environmental issue, should also translate into strong environmental policy beliefs.

> *Hypothesis #8: Those policy community members who are strongly concerned about climate change will also have strong environmental policy beliefs.*

Also included in Figure 4-1 is the variable labeled "sector cluster." This cluster, which represents the three sectors (agriculture, forestry, and water), was included in the model in order to determine if sector membership *along with* or *rather than* organizational membership is an important factor in influencing informal coordination networks. It was hypothesized that sector would have no impact on the informal coordination networks, policy beliefs, or a concern for climate change. These are illustrated in null hypotheses H_o#1 through H_o#4.

Figure 4-1. Conceptual model of the hypotheses tested



Data and methodology

Data

The data for this study is derived from an online web survey (December 2001 to January 2002) given to elite policy community 'actors' (agriculture, forestry, and water sectors) in the three prairie provinces (Wellstead *et al.* 2004). The boundary of each policy community was identified using similar methods employed by Laumann and Knoke (1987) and Sabatier and Zafontane (1995). Wellstead *et al.* (2004) selected those individuals who were deemed to be in a recognized position of policy influence. These included senior provincial and federal government personnel, managers and directors of producer groups, Crown agencies, environmental and conservation groups, First Nations representives, consultants, and academics. Due to the small size of the study population, a census was drawn rather than a random sample.[38] Study participants were identified through extensive searches of their respective organizations' web-pages and/or telephone directories. In most cases, an e-mail directory of key personnel, such as directors and managers, was readily available. If not, the organization was contacted and a list was requested. All of the study participants from federal and provincial government agencies and practically all other respondents from organizations had unique personal workplace e-mail addresses. A total of 851 individuals were identified as belonging to the prairie agriculture, forestry, and water resource policy communities.

An initial introductory e-mail was sent to all potential participants informing them of the forthcoming survey; this e-mail also permitted the authors to detect any "dead" e-mail addresses. Two follow-up reminder e-mails were sent ten days a part after the initial survey sent out. Of these, 356 provided usable responses, for a return rate of 41.8%. In order to assess non-response bias, Wellstead *et al.* (2004) compared the proportions of organizational, sectoral, and provincial respondents to the population of potential respondents initially identified, finding that these two groups closely reflected one another. The only exception was for the forest industry; although this group originally represented 11% of the identified study population, only 6.7% of the respondents were from this group.

Methodology: Survey content

The survey's questions, which closely resembled those asked in Sabatier and Zafonte's (1995) San Francisco Bay/Delta Water Policy survey,[39] considered the following: the perceptions of the policy problem; the deep normative core beliefs and the policy core beliefs; and the informal coordination of network linkages. Unlike previous ACF research, this study did not examine secondary aspects of policy beliefs. Without any climate-specific policies in place, well-established secondary aspects have yet to emerge. However, the results from the structural equation model

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[38] Same as Sabatier and Zafonte (1995)

[39] I would like to thank Paul Sabatier for providing me the Bay-Delta questionnaire and making suggestions regarding the development of my survey's content.

below propose that informal coordination networks may provide indicators of the development of future secondary aspects and subsequent policy learning.[40] The complete survey instrument is included in Appendix B.

Structural equation model

Structural equation modeling has become a very popular research tool in the social sciences because of its capabilities of understanding and predicting complex phenomena (Kelloway 1995). This chapter takes the perspective, as advocated by Hayduk (1987) (1990), that model evaluation arises from stressing the links between theory and the modeling of data rather than coordinating constraints in a statistical model with the data at hand. Furthermore, Hayduk (1996) states that 'much of the art of good LISREL modeling is in attaining a close match between the verbal fictions we call theories and the mathematical fictions we call models" (p.35). For those readers not familiar with structural equation models, a discussion of the three basic equations and their coefficient and covariance matrices are provided in Appendix C.

[40] The survey also asked questions relating to risk perception and knowledge about climate change.

Results

Describing the respondents

Geographically, there were nearly the same number of respondents located in Alberta (36.7%) and Saskatchewan (35.1%). Only 16.0% of the respondents were Manitoban. Some of the respondents (11.2%) were located outside the prairies; these were mostly decision-making individuals within federal departments and some national organizations, which were headquartered in Ottawa or Toronto. The largest proportion of respondents came from the agriculture policy community (40.7%) followed by forestry (33.4%) and then the water resources policy community (25.8%). Nearly 60% of the respondents were employed by government agencies. This finding reflects the original population and was not an artifact of the survey. More importantly, it highlights the prevalence and participation of the state in natural resources policy making (Smiley 1975; Howlett and Rayner 1995). From the remainder of the participants, agriculture producer groups were the second largest employer (12.1%). Those who were self-employed, employed by universities, forest industry organizations, or environmental groups equally made up the remainder of the scores greater than 5%. For ease of comparison and statistical reliability, the number of organizations was reduced to nine major organizational clusters (Table 4-1).

Table 4-1. Initial organizational clusters

	Frequency	Percent
Provincial environment agencies	84	23.6
Federal agencies	57	16.0
Provincial agriculture agencies	48	13.5
Agricultural producer groups	43	12.1
Research institutions	34	9.6
Forest industry	24	6.7
Environmental groups	19	5.3
Consultants	15	4.2
Other	17	4.8
Total	356	100.0

The survey item, concern for long-term climate change (which also became one of the structural equation model's dependent variables), was asked along with other important policy natural resource issues. Respondents ranked concern for climate change (3.65 on a 1-5 scale) as the fourth most important policy problem from a list of 15. The highest scoring item was concern about protectionist trade policies (3.92). Climate change related items of concern, which were ranked in the top five, included: increased frequency of droughts on prairie agriculture lands (3.91), poor quality of

prairie water supply for urban and/or agriculture users (3.82), and water restrictions/shortages (3.64). Three other climate change items of concern were asked: the danger of increased flooding (2.77) and the susceptibility of forests to wild-fire (3.31) and insect damage (3.31).[41]

Network of informal coordination

Respondents were asked three ally network related questions. Respondent were asked to identify up to three organizations they regarded as allies. For each organization, they were asked how often they shared information; if they developed a joint position and/strategy; and if they would voluntarily modify their own organization's behaviour to achieve a common goal. The scores for these items were determined on a 1-5 scale. Respondents were also asked to identify up to three organizations they considered to be their opposition.

In Figure 4-2 (organizations regarded as allies), federal government respondents made up 16.0% of the total responses (n=128) and 246 respondents identified the federal government (30.8%) (Table B-1 in Appendix D presents the results in tabular form). The provincial government contained the largest number of respondents (n=343). However, they had a proportionally lower number of other respondents identifying them as allies (n=175). Research organizations also received a relatively large number of identified responses.

Figure 4-3 presents the relative strength of the network links by calculating the ratio between the respondent's organization and the identified organization (Table B-2 in Appendix D presents the results in tabular form). For example, in Figure 4-2, the thick arrow from 'provincial government' to 'federal government' indicated that 105 provincial government respondents considered federal government organizations to be an ally. The ratio of provincial government respondents identifying with the federal government to the total number of provincial government respondents was .32 (Figure 4-3). In contrast, the link between environmental respondents who identified with the federal government was N=9 in Figure 4-2. However, the ratio statistic is .27. The results from Figure 4-3 reveal that there was a fairly uniform level of support by all organizations for the federal government (between .34 and .27). Similarly, the level of support within a organizational cluster was also similar in the case of all organizational clusters except for the federal government. Their ratio score was .46 (compared to ratios of .28 to .37). Support for the provincial government was lower but the second highest (ranging from .13 to .22).

Only a minority of respondents (n=134 or 37.6%) replied to this question: indicate up to the three organizations you regard as your principal opposition (Figure 4-4). Environmental groups were regarded as the main source of opposition (n=156 or 37.2%) of the 417 opposition responses, especially by provincial environment agencies and the forest industry. Conversely, neither levels of government were considered a source of opposition.

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[41] These items ranked 8th, 10th, and 15th respectively.

Figure 4-2. Organizations regarded as allies (sharing information, developing joint policy positions, voluntarily modifying organization's behavior)

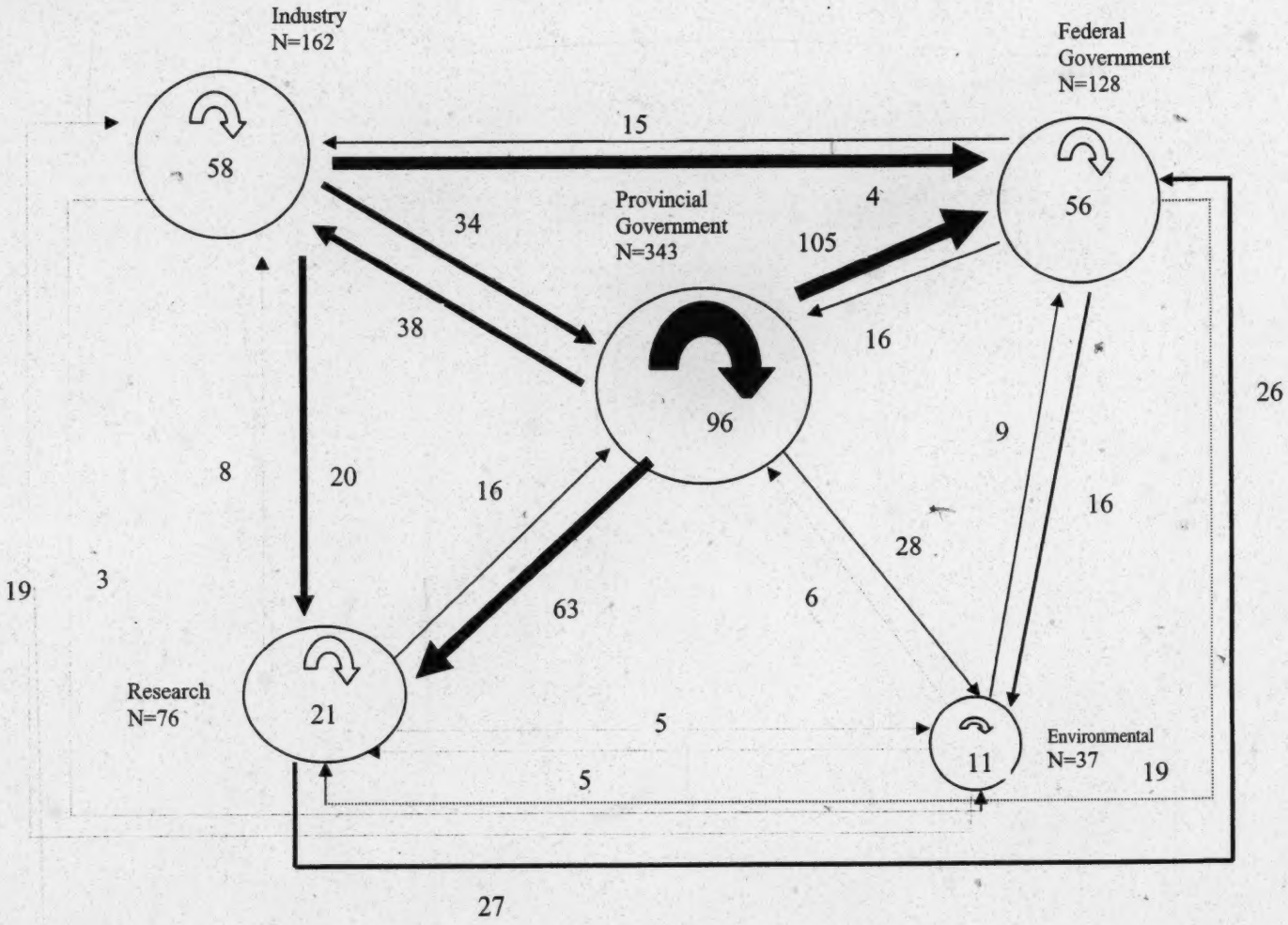


Figure 4-3. Organizations regarded as allies (sharing information, developing joint policy positions, and voluntarily modifying organization's behavior) (Based on the ratio between the respondent's organization and the identified organization)

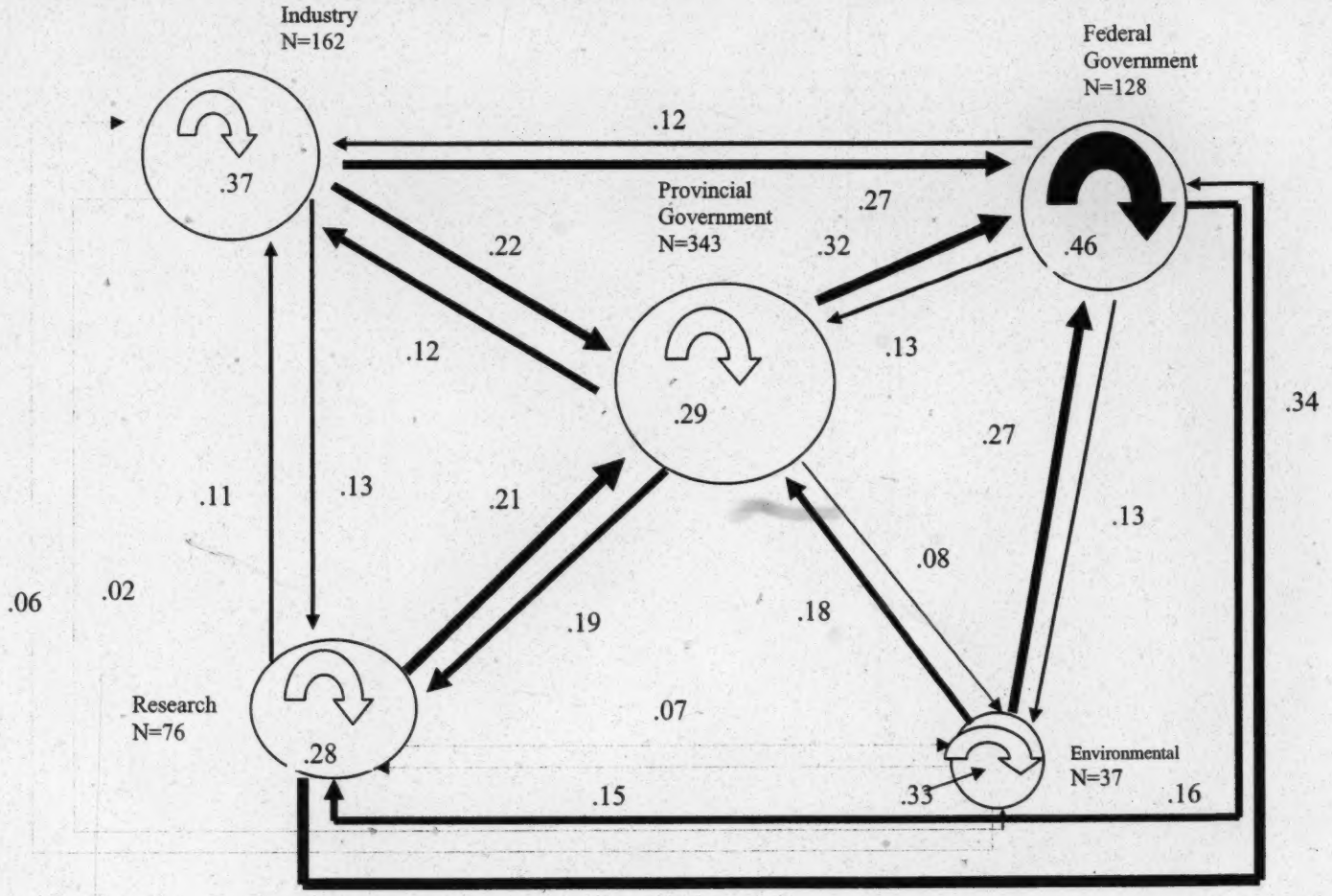
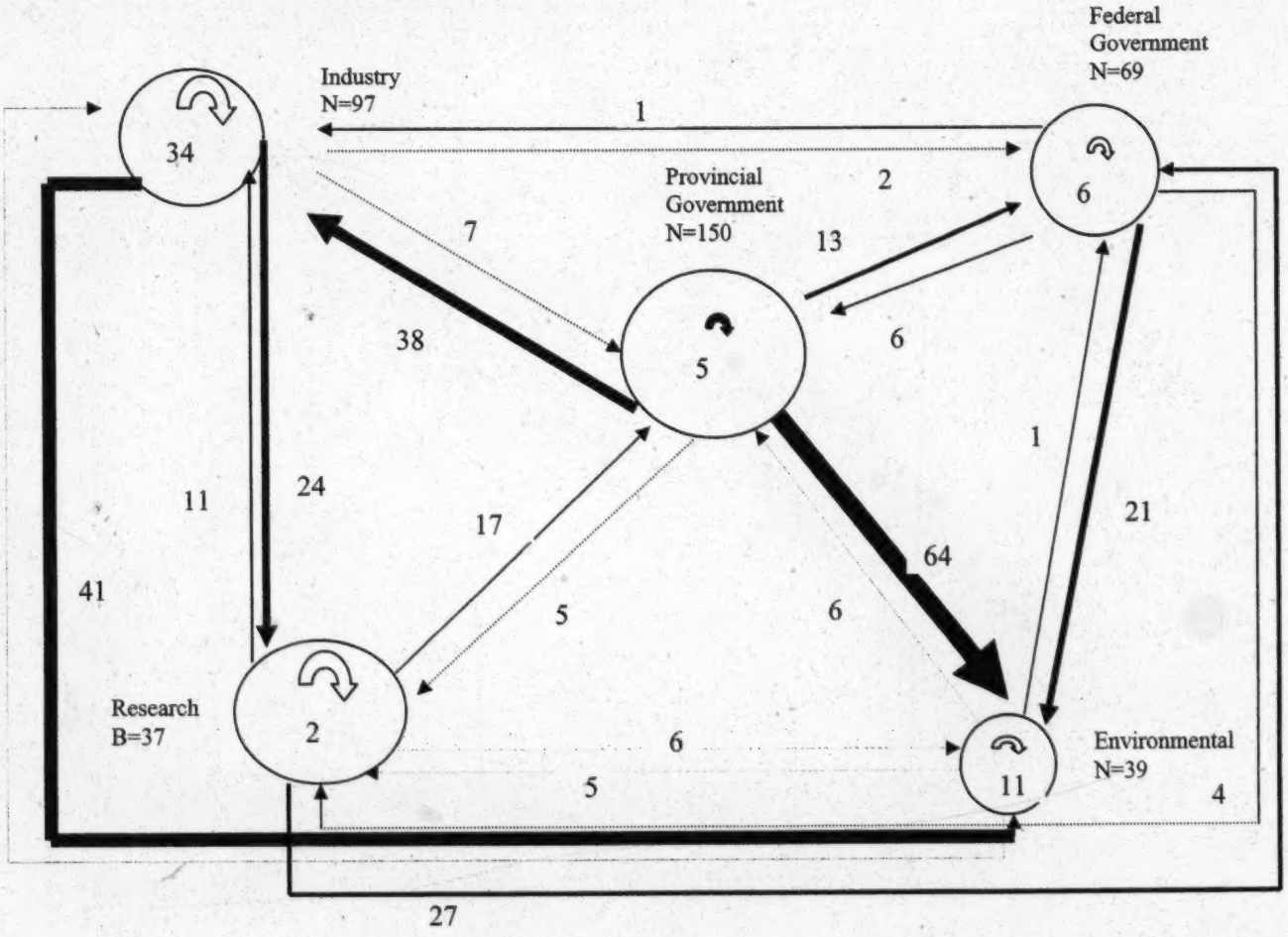


Figure 4-4. Organizations regarded as opposition



Measuring core beliefs

Previous analyses, most notably Stedman *et al.* (2004) and Wellstead *et al.* (2004), have used the same data set to measure ACF related policy related beliefs. In this section, core normative beliefs are calculated. These general beliefs serve as causal antecedents to more specific policy core beliefs. In Table 4-2, the items resulted in two distinct groupings: a five-item anthropogenic (human) centred domain and a seven-item ecological domain. The ecological items (Table 4-2) are a subset of those that represent the "New Environmental Paradigm" (NEP) developed by Dunlap and Van Liere (1978). The structure was largely, although not precisely, supported by factor analysis, for the NEP-based items tended to separate into sub-domains: a general ecological domain and a "limits to growth" domain (Stedman *et al.* 2004) (See Appendix E for the factor table). However, these items were combined into a single ecological scale. When a reliability analysis was conducted strong alpha scores were obtained (0.773 for the ecological domain and 0.669 for the anthropological domain.

Table 4-2. Structure of deep normative core beliefs

Item	Mean
Anthropocentric beliefs	
A first consideration of any good political system is the protection of property rights	3.26
The best government is the one that governs the least	2.77
Decisions about development are best left to the economic market	2.33
Most environmental problems can be solved by applying more and better technology	2.76
Plants and animals exist primarily to be used by humans	2.28
Ecological beliefs	
The balance of nature is very delicate and easily upset by human activities	3.59
Ecological rather than economic factors must guide our use of natural resources	3.30
We attach too much importance to economic measures on the well-being of our society	3.40
We are approaching the limit of the number of people the earth can support	3.33
When humans interfere with nature it often produces disastrous consequences	3.25
Humans must live in harmony with nature in order to survive	4.14
There are limits to growth beyond which our industrialized society cannot expand	3.93

Table 4-3. Summary of variance for factored normative core beliefs

Normative Beliefs		Sum of Squares	df	Mean Square	F	Sig.
Anthropocentric beliefs	Between Groups	172.637	8	21.580	2.343	.019
	Within Groups	2836.618	308	9.210		
	Total	3009.256	316			
Ecological beliefs	Between Groups	994.215	8	124.277	5.234	.000
	Within Groups	6909.731	291	23.745		
	Total	7903.947	299			

A comparison of organizational means using ANOVA and Dunnett's C test for heterogeneity found that both the anthropocentric and ecological beliefs had significant variance scores. The mean scores for the anthropocentric beliefs did not produce any subsets. However, in Table 4-4, the ecological beliefs produced three subsets, indicating heterogeneity between the organizational clusters. The table revealed that environmental groups and research groups were distinctly different from forest and agriculture industry groups. Also, both of these societal-based groups were distinct from the government cluster.

Table 4-4. Ecologically based normative policy beliefs

Organizational Clusters	N	Mean score		
		1	2	3
Forest industry	21	22.15		
Agricultural producer groups	37	23.04		
Provincial government agriculture agencies	44	23.92	23.92	
Provincial government environment agencies	78	24.91	24.91	
Other	10	25.00	25.00	
Federal government agencies	50	25.36	25.36	
Consultants	12	26.33	26.33	
Research institutions	31			27.26
Environmental groups	17			30.00

The eight organizational clusters identified in Table 4-5 (as in Stedman *et al.* 2004) were further aggregated into three organizational clusters: government, industry, and environment-research. A comparison of means using ANOVA and Dunnett's C test for heterogeneity was repeated (for these three clusters) and found that the environmental/research organizational clusters were significantly different in the case of ecological beliefs.[42] The three organizational clusters formed three of the six independent variables in the structural equation models.

[42] Dunnett's C test for heterogeneity assumes unequal variances

Structural equation model variables

The model's endogenous and exogenous variables are listed in Table 4-5 and the descriptive statistics are presented in Table 4-6. The first four endogenous variables are the ally coordination networks variables (ALLYINDUSTRY, ALLYFEDGOVT, ALLYPROGOVT, and ALLYENVRES). These were derived by taking the scores from three specific network related variables and aggregating them into (federal government, provincial government, industry, and environment/research organizations) four coordination variables. A reliability analysis of network questions (variables) (share information, voluntarily modify my organization's behaviour to achieve common goals, and develop a joint position) resulted in alpha scores (for each of the three possibilities) of 0.796, 0.814, and 0.757, respectively. [43] GHGCONCERN (concern for long-term greenhouse gas emissions) and ECOLOGICAL (ecological based normative beliefs) round out the model's endogenous variables. The six exogenous variables are organizational based and sectoral based.

Table 4-5. List of model variables

Variable Label	Description
Endogenous variables	
ALLYINDUSTRY	Industry "ally" network
ALLYFEDGOVT	Federal government "ally" network
ALLYPROVGOVT	Provincial government "ally" network
ALLYENVRES	Environmental-Research "ally" network
GHGCONCERN	Concern for long-term greenhouse gas emissions
ECOLOGICAL	Ecological based normative beliefs
Exogenous variables	
INDUSTRY	Industry organization membership
GOVT	Government organization membership
ENVRESRC	Environment/Research organization membership
AGRIC	Agricultural sector
FOREST	Forestry sector
WATER	Water sector

[43] For example, in the case of variable ALLYINDUSTRY (Table 4-5), if a respondent identified two industrial organizations (A and B) he/she then indicated on a 1-5 scale how important the three identified reasons were. Thus if for industry organization A, he/she indicated a 3 for the question regarding whether they would share information, a 4 for willing to modify their organization's behaviour, and a "2" for developing a joint position and/or strategy, the total score would equal 9. The same items would be summed again for industry organization B. If the score for organization B was 10, the total score would be 19. If, in addition to the two industry organizations, the respondent also chose a federal organization C as the third organization of the maximum allowable three organizations to choose from, then the same summing process would be undertaken. The maximum possible score for every network variable (ALLY INDUSTRY, ALLYFEDGOVT, ALLYPROVGOVT, ALLYENVRES) was 45.

Table 4-6. Descriptive statistics of variables used in the model

Model Variables	Mean	Max	SD
ALLYINDUSTRY	4.30	45	7.78
ALLYFEDGOVT	5.57	45	7.24
ALLYPROVGOVT	4.65	45	6.79
ALLYENVRES	5.95	45	8.68
GHGCONCERN	3.67	5	1.18
ECOLOGICAL	24.98	35	5.14
INDUSTRY	.188	1	.391
GOVT	.571	1	.496
ENVRESRC	.149	1	.356
AGRIC	.406	1	.491
FOREST	.333	1	.472
WATER	.257	1	.438

Structural equation model results

The model's maximum likelihood estimates, which were obtained using LISREL 8.3, are presented in both Table 4-7 and Figure 4-5. (Jorgeskog and Sorbom 1996). The models fit the data well in that the observed covariances closely match the model-implied covariances. The P-value was 0.63324. The modification indices means that no effects currently excluded from the model, if added, would significantly improve the model fit.

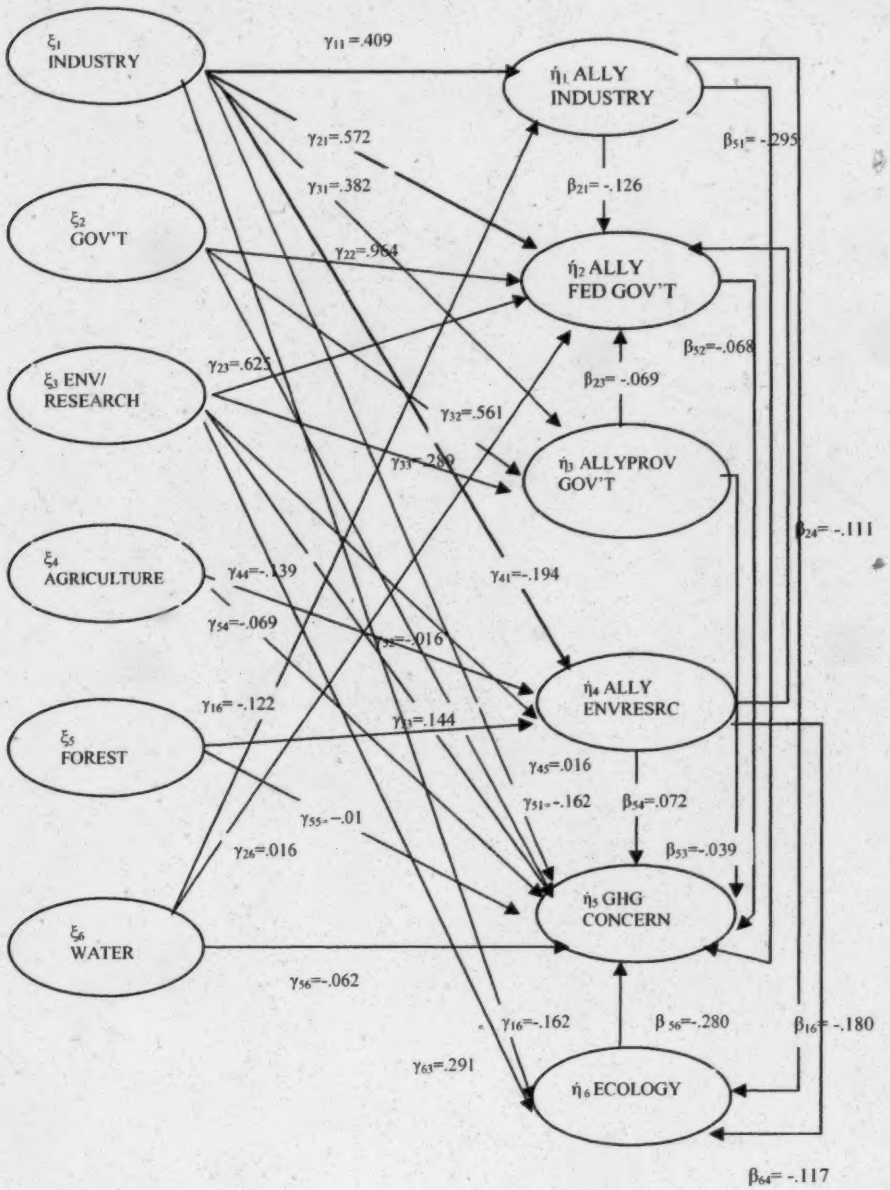
Table 4-7. Maximum likelihood estimates for ally coordination network

Effect from	To	Effect	Standardized Effect
INDUST			
	ALLYINDUSTRY	8.055**	.406
	ALLYFEDGOVT	10.591**	.572
	ALLYPROVGOVT	6.614*	.382
	ALLYENVRES	-4.305*	-.194
	GHGCONCREN	-.500**	-.166
	ECOLOGY	-2.121*	-.162
GOVT			
	ALLYINDUSTRY	.350	.022
	ALLYFEDGOVT	14.085**	.964
	ALLYPROVGOVT	7.682**	.561
	ALLYENVRES	-2.909	-.166
	GHGCONCREN	-.038	-.016
	ECOLOGY	-1.115	-.018
ENVRESRC			
	ALLYINDUSTRY	.089	.004
	ALLYFEDGOVT	12.817**	.631
	ALLYPROVGOVT	6.892**	.362
	ALLYENVRES	-.7.38	-.030
	GHGCONCREN	.476**	.144
	ECOLOGY	3.179**	.221
AGRIC			
	ALLYINDUSTRY	.291**	.019
	ALLYFEDGOVT		
	ALLYPROVGOVT		
	ALLYENVRES	-2.450**	-.139
	GHGCONCREN	-.024	-.011
	ECOLOGY	-.379	-.036
FOREST			
	ALLYINDUSTRY		
	ALLYFEDGOVT		
	ALLYPROVGOVT		
	ALLYENVRES	-2.450**	-.139
	GHGCONCREN	.0056	.028
	ECOLOGY	.073	.015
WATER			
	ALLYINDUSTRY	-2.159**	-.122
	ALLYFEDGOVT	.257*	.015
	ALLYPROVGOVT		
	ALLYENVRES		
	GHGCONCREN	.110	.041
	ECOLOGY	.278	.024

ALLYINDUSTRY	GHGCONCERN	-.045**	-.295
ALLYFEDGOVT	GHGCONCERN	.003	-.068
ALLYPROVGOVT	GHGCONCERN	-.007	-.039
ALLYENVRES	GHGCONCERN	.0010	.072
ALLYINDUSTRY	ALLYFEDGOVT	-.119*	-.126
ALLYPROVGOVT	ALLYFEDGOVT	-.073	-.069
ALLYENVRES	ALLYFEDGOVT	-.057	.068
ALLYINDUSTRY	ALLYENVRES	.120**	-.135
ALLYINDUSTRY	ECOLOGY	-.119**	-.180
ALLYFEDGOVT	ECOLOGY	.026	-.037
ALLYPROVGOVT	ECOLOGY	-.070	-.093*
ALLYENVRES	ECOLOGY	.069**	.117
ECOLOGY	GHGCONCREN	1.431**	.329

*t>1.6; **t>2.0

Figure 4-5. Ally coordination networks model with standardized effects (N=356)



Chi-square=16.36, df=19, P-value=0.63324, RMSEA=0.000

The following discussion of the results first examines the impact that organizational and network membership has on the concern for climate change. This discussion is followed by an examination of three organizational variables (INDUST, GOVT, and ENVRESC) and how supportive they are of the four networks. For example, how strongly do individuals who belong to an industry group consider the federal government to be an ally? Also organizational ecological policy-based beliefs are examined. The third set of results examines the effects from the industry, provincial, and environmental-research networks to the federal government network (ALLYFEDGOVT). Finally, the network's policy beliefs are examined.

Concern for climate change among the main organizational clusters revealed that industry-based respondents (INDUST) were the least likely to consider the issue to be a problem (γ=-.166) whereas environmentalist and researchers exhibited a stronger (positive) concern (γ=.144). The insignificant estimates for government based respondents indicated that belonging to government agency did not affect the concern on climate change. Thus climate change is a more pressing issue for those policy community members belonging to industry and environmental/research groups. However, the effect was even greater (γ=-.295) for those who considered industry to be an ally. A corresponding positive estimate did not materialize for those who considered the environmentalists and researchers to be allies. Finally, those who had stronger ecological policy beliefs considered climate change to be an important issue (β=.280).

All of the effects from INDUST (respondents belonging to an agriculture or forest industry organization) to the four networks and policy belief variables were significant. Not surprising, industry-based groups were strongly allied with the industry network (γ=.406). However, the industry organization cluster had equally strong scores when the federal government (γ=.572) or provincial government (γ=.382) network was considered an ally. Conversely, environmental/research groups were more likely not to be allies of industry groups (γ=-.166). Environmentalist and academic researchers (ENVRESRC) presented strong ecological policy beliefs (γ=.221) compared to the industry respondents. However, environmentalists and researchers also illustrated the same strong positive relationship with federal (γ=.631) and provincial government (γ=.362) ally networks. However, there was no effect of their organizational cluster to a corresponding environmental-research coordination network. The government organizational cluster (GOVT) was the most likely to agree that it was allied with both the federal and provincial ally networks but indicated no acknowledgement of the societal based networks.

The informal industry coordination network (ALLYINDUST), as reported above, was the least likely to be concerned about climate change (β=-.295); it also demonstrated negative ecological based policy beliefs (β=-.180). These two estimates were higher than the scores made by those belonging to industry-based groups. Those same respondents were more likely to have a negative view of the federal government network (β=-.126), which contrasted with the strong positive estimates from industry organizational respondents. Absent were any notable effects from the government based coordination networks (ALLYFEDGOVT and ALLYPROVT) to any of the other endogenous variables (ALLY INDUSTRY,

ALLYENVRES, ECOLOGY, and GHGCONCERN).[44] Those who allied themselves with the environmental groups and researchers (ALLYENVRES) exhibited positive environmental policy oriented beliefs (β=.117). This estimate was similar to the standardized coefficient estimate of organizational environmental-research based respondent's policy beliefs.

Finally, the exogenous sector variables (AGRIC, FOREST, and WATER) did little to affect the model's overall fit. Very few of the effects were significant (p>1.6). The only noteworthy result were the negative estimates for the environmental-research network by agriculture (γ=-.139) sector respondents.

Discussion and conclusion

Climate change has become an important government agenda item across the Canadian prairies. The federal government has dedicated considerable resources to the development of large-scale strategies that seek to address this issue. However, because there are few forums for policy elites, there is great difficulty in implementing policy change in Canada.

The results derived from the comparison of means, descriptive network analysis, and structural equation modeling permit a discussion of the eight hypotheses introduced earlier in the chapter. First, the results reveal a large government advocacy coalition dominating in the prairie agriculture, forestry, and water policy communities *(Hypothesis #1)*. This coalition is largely a function of the population's composition; that is, the large federal and provincial government presence. However, as illustrated in Table 4-4, industrial and environmental-research based policy community members have their own unique subsets of policy beliefs. These results contrast with nearly all other ACF studies in which the existence of a larger variety of government departments and agencies within a policy community leads to some government organizations aligning their beliefs with societal based interests.

In contrast to the demarcation of societal and government advocacy coalitions, all of the prairie agriculture, forestry, and water policy elites strongly identified with the federal government informal coordination network (*Hypothesis #2*). In the case of climate change, this allegiance to the federal government is anticipated because of the high level of funding and expertise offered by federal departments. Moreover, federal responsibilities in natural resource management are considerably lower than those of the provincial-level departments. As a result, many policy actors would be willing to work with agencies that offered considerable resources without direct management consequences. All respondents identified strongly with the provincial government's informal coordination network, but, as discussed above, at lower level. *Hypothesis # 3 (Policy elites will have a strong allegiance to informal networks representing their corresponding organizations)* was only partially accepted. There was very strong support for both government networks by government policy elites and strong support of industry networks by industry policy elites. However, environmental-research networks did not garner the same alliance by those belonging to environmental-research based organizations. This was a very surprising outcome considering the strong ecological based beliefs exhibited by this group.

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[44] The standardized effect from ALLYPROVGOVT to ECOLOGY was γ=-.093 (p> 1.6)

Despite the strong level of support for the federal government by the rest of the population, and despite the federal government's moderate policy beliefs, the other networks failed to reciprocate strong alliances towards the federal government network. The acceptance of *Hypothesis #2* and the rejection of *Hypothesis #4* provide the most striking contrasts between organizational membership and network identification. This imbalance is problematic in the case of a climate change policymaking process—a process that is supposed to be a collaborative undertaking by a variety of interests. This imbalance, then, implies that those policy elites who identified with the provincial government, industry, and environmental groups and research organizations are not inclined to identify with the federal government.

The influence of policy beliefs coordinating informal networks did not materialize (thus not supporting *Hypothesis #5*). This result demonstrates the independent role that informal networks play in Canadian natural resource policy-making; furthermore, it challenges Zafonte and Sabatier's (1995) assertion that policy-oriented beliefs are the 'glue' of coordination. However, societal-based policy elites exhibited strong concern about climate change *(Hypotheses #6a and #6b)*. Industrial respondents were less concerned about climate change compared to environmental/research respondents. Not surprisingly, this hypothesis was supported. However, the climate change issue, as supported by *Hypothesis #8 (Those policy community members who are strong ecological beliefs will also be concerned about climate change)*, was foremost a belief oriented issue. This hypothesis was clearly supported. Moreover, confirmation of *Hypothesis #8* suggests that those who should be addressing climate change in the prairie agriculture, forestry, and water sectors should also have ecologically-based policy beliefs. However, such a concern was not present by those individuals who influence the direction of policy (either as those who control the federal government funding or as those who develop specific policies, such as actors with provincial governments).

Finally, in *Hypothesis #7*, which examined the industry and environmental-research network was support of climate change, the results were mixed. The industry network less concerned about the concern for climate change (β=-.295) (compared to the organizational estimate of β=-.168) whereas a comparison with the environmental-research network and organization did not exist given the insignificant effect from environment-research network to the concern for climate change. These scores suggests that the concern for climate change was a function of environment-research organizational based belief structures, but those policy community members less concerned about climate change were attracted to industry-based networks. And, as discussed above, industrial-based networks tend not to be belief driven.

A bleak picture of future action on climate change emerges when the solitudes between closed and polarized networks are considered. However, there is strong support for federal organizations, but when key decision-makers choose to form a network of like-minded individuals, their alliances become very insular. This point is particularly troubling specific long-term climate change policies that will require collaborative as opposed to oppositional networks. In a highly technical area such as climate change, many of the policy solutions will emerge from policy learning between competing coalitions. However, an environment facilitating policy learning would alleviate the existence of an oppositional network structure. Meaningful policy

change will require network brokers who need to begin the process of establishing ties across prairie natural resource policy communities. It is hoped that, from the findings of this chapter, these policy elites will realize that the current decision-making environment they face renders long term meaningful climate change policy untenable.

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Chapter 5 – COMPLEXITY AND CHANGE: WHAT DOES IT MEAN FOR NATURAL RESOURCE POLICY MAKING?

Introduction

This chapter gauges the significant and original scholarly contributions made over the course of this dissertation. It assesses how well the two driving themes, complexity and change, were addressed. They are considered within the lens of both a multi-disciplinary natural resource and a political science/policy research perspective. In the next section, the relevance of this dissertation within multi-disciplinary natural resource research (particularly climate change and forestry) is discussed in the context of a popular research tool, the integrated assessment impact model. These models, unfortunately, do not consider the importance of *homo politicus*. Rather, political systems are considered exogenous to these models.

The following section highlights the original contributions of this thesis to political science. This dissertation has its tenets in political science and explores some of its most salient research areas: state theory, organizational theory, and policy sciences. In Chapter Two and Chapter Three significant theoretical contributions were made whereas Chapter Four highlighted the feasibility of undertaking quantitative methods in policy related research. The final section discusses some of the limitations encountered and avenues for future research.

Opening the Black Box: Contributions to multi-disciplinary research

Integrated assessment impact frameworks and models have become popular in natural resource research, particularly when examining climate-change related issues. Such research has attracted multidisciplinary teams of natural scientists and social scientists seeking to explain the complexities associated with climate-change impacts. Their main intention is to develop broad recommendations that will lead to changing management practices and supporting policy making (Linder *et al.* 2002). These models have produced a rich array of policy options and criteria for their evaluation by what is portrayed in the literature as omnipresent decision-makers. For example, Toth's (2003) overview of the Integrated Assessment of Climate Protection Strategies (ICLIPS) project considers the linkages between aggregated and disaggregated economic models, climate models, a land use change models, and ecological models to "advise policy makers on response strategies to global climate change." However, all of these integrated models share one common shortcoming: they fail to consider the policy-making system itself as an inherent part of the larger system they seek to investigate. That is the policy-making system is viewed separately from the climatic, ecological, economic, and social systems. This omission is a serious flaw because there is an implicit assumption that recommended (optimal) solutions should be implemented. However, optimal solutions are rarely formulated and implemented into public policy. This dissertation provided a number of areas considering the inclusion of the "political" into these multi-disciplinary models, and within natural resource research in general.

A systems approach is the focal point of all integrated assessment impact frameworks. Chapter Two examined a renewed conception of the staples-based state. States functions within, and respond to, a global capitalist system. The shift from the Keynesian National Welfare State to a neo-Ricardian competitive state will have an impact upon natural resource sectors and more specifically, climate change policy. In some provincial states, there will be a renewed interest in maintaining static levels of competition in traditional sectors such as staples, those labeled as Schumpetarian competitive states will look to facilitate a knowledge-based economy with less emphasis upon resource development. These broadly different state strategies will have an impact upon how ecological and climatic issues are addressed. A neo-Ricardian competitive state because of its dependence on the exploitation of the most abundant and cheapest factors of production may find adapting to such changes difficult. The Schumpetarian competitive state, on the other hand, which is largely preoccupied with perpetual innovation, competitiveness, and entrepreneurship, may lead to a completely different response to the same set of issues.

For those promoting integrated frameworks, the pressing concerns, are the different levels of possible impacts. For example, climate change scientists argue that impacts on a national scale may be different than impact at regional or local levels. Both Chapters Two and Three addressed this concern. However, as Migdal (2001) points out, the state is not a holistic entity but rather a variety of levels responding to a host of different societal pressures. The complexity of the state is also captured in the neo-pluralist literature that highlights the structural differentiation within and a disaggregated view of the state. A more refined discussion of the different policy-making levels and the role of organizations were highlighted in Chapter Three. The range of complexity dynamics in policy-making framework, which combines political science and complexity theory, dispels the naïve notion of the omnipresent "policy-maker." Policy is, in fact, "made" in a complex multi-level system involving many organizations - each with its own unique competencies and capacities. Policy decisions, it was discovered, could be made within a rationally linear context or alternatively, decided in a biotic system of emergent properties. Whereas integrated assessment models are indicative of the state of multidisciplinary research within the natural resources. The two theoretical chapters (Chapters Two and Three) provide new methods of including the political system within these models. The challenge will be to convince other disciplines that political science *should* be included in natural resource research. This dissertation is a starting point.

Contributions to the discipline

Equally important for this dissertation are the significant contributions made to the discipline of political science which is presented in the three chapters. The order of the chapters was intentional, for they began with the macro-level in Chapter Two followed by the meso-level in Chapter Three, and finally the micro (individual) level in Chapter Four. Each chapter illustrated significant contributions in three very diverse political science disciplinary sub-fields: political economy, policy sciences, and quantitative research.

Previous attempts to understand a staple-based state have been, at best, myopic. The post-staples thesis presents an original attempt to understand the staples

economy within rapidly changing globalized context. However, this trend remains, at best, an uneven one. These changes have also brought about a renewed understanding of the state - not entirely uncovered in a post-staples state thesis - namely the emergence of the competitive state. The concept of the neo-Ricardian competitive state explains that despite their overall decline as a contemporary national economic driver, staples remain an important consideration within many, if not, most of Canada's provinces.

In Chapter Three, the role of organizations and multiple levels of policy-making were identified as significant challenges within policy research. In response, a theoretical framework capturing the full range of complexity dynamics within policy-making process was introduced. This meta-theoretical framework overcame the linear tendencies exhibited in most sectoral specific policy process frameworks and models. As a result, an understanding of the policy process was expanded to include both national and provincial policy domains, as well as other levels (such as community considerations) that have been deemed to be important yet were marginalized in previous approaches.

Finally, Chapter Four's main objective was to empirically examine the role of informal coordination networks in a nascent policy area (climate change). However, the quantitative approach employing survey data is, in itself, a unique contribution. A review of empirically based studies in *Canadian Journal of Political Science* will reveal, that, outside of voting and electoral studies, very few studies are quantitative in nature. That is, qualitative case studies continue to dominate the Canadian political science research agenda. This starkly contrasts the sophisticated quantitative policy research in U.S. studies. The popularity of relatively inexpensive internet-based survey research provides an opportunity for Canadian based researchers to gather important information across diverse policy elite populations (Dillman 2000). Unfortunately, statistical methodology and research is fast becoming a lost art among contemporary Canadian political scientists. Very few Canadian political science departments make statistical and/or research methods a mandatory course option. However, from Chapter Four's results and discussion, a great deal was learnt in understanding the challenges to undertaking change policymaking across the prairies.

Limitations

Nonetheless, there are a number of limitations worth noting. The first is found in Chapter Three where there is a considerable amount of effort, albeit necessary, outlining the main research gaps and describing popular policy process frameworks before introducing and discussing the application of complexity theory and fuzzy logic within a policy context. As a result, a case study would require another full paper.

The most surprising aspect of the prairie agricultural, forestry, and water sectors was its policy elite's small population size. For example, the population of Sabatier and Zafonte's (1995) San Francisco Delta-Bay water policy network equalled the population examined in Chapter 4. This small population over such a large geographical area made analysis difficult, particularly in Manitoba's small forest and water sectors. Also, troubling was the small aboriginal population identified as part of the study population. It is unclear, whether or not their exclusion

was the function of a small role as policy actors or the selection process developed in the study design. Furthermore, strategic behaviour by the respondents in the online survey may have been present but was not determined.

Future research directions

This dissertation proposes a number of notable future research directions. First, in the coverage of heterarchic networks in Chapter Three, research should be undertaken to examine the linkage between the complex policy-making process with network governance and the roles of resource dependent communities, scientists, and First Nations. Of this group, the role of First Nations within the forest policy process represents a timely area of research. The combination of a growing aboriginal population, demands for self-governance, and greater land- management responsibilities will inevitably lead to a changing composition of forest policy communities. Aboriginal actors will shift from disengaged spectators to active policy actors.

The second research area is developing an understanding of the capacity, commitment, and competence of policy community organizations. Chapter Four examined the climate change attitudes and beliefs of policy elites. However, as revealed in Chapter Three, an organizational response is often contingent upon both the decision-making system and the level of complexity encountered. As highlighted in Chapter Two and Chapter Four, the state, more specifically large omnibus departments agencies, plays a significant role in the policy making process. Within each is a vast technical core of experts and managements responsible for the dissemination of information as well as those known as policy-elites, namely the organization's decision-makers. A pressing research question would be the following: how different are the attitudes and beliefs between these two groups?

The final suggested research direction would be a replication of the survey used in Chapter Four. This would entail a geographic expansion that would include Atlantic Canada, Quebec, Ontario, and British Columbia. An updated replication would also result in a longitudinal study in the case of the prairies. In the case of a geographic expansion, comparisons could be made across regions. Although Chapter Four found no significant differences across the prairies, there may differences, for example, between the attitudes and beliefs of Ontario forestry policy elites and their British Columbia counterparts. A time series study across the prairies could indicate if attitude changes towards climate had occurred over the past five years.

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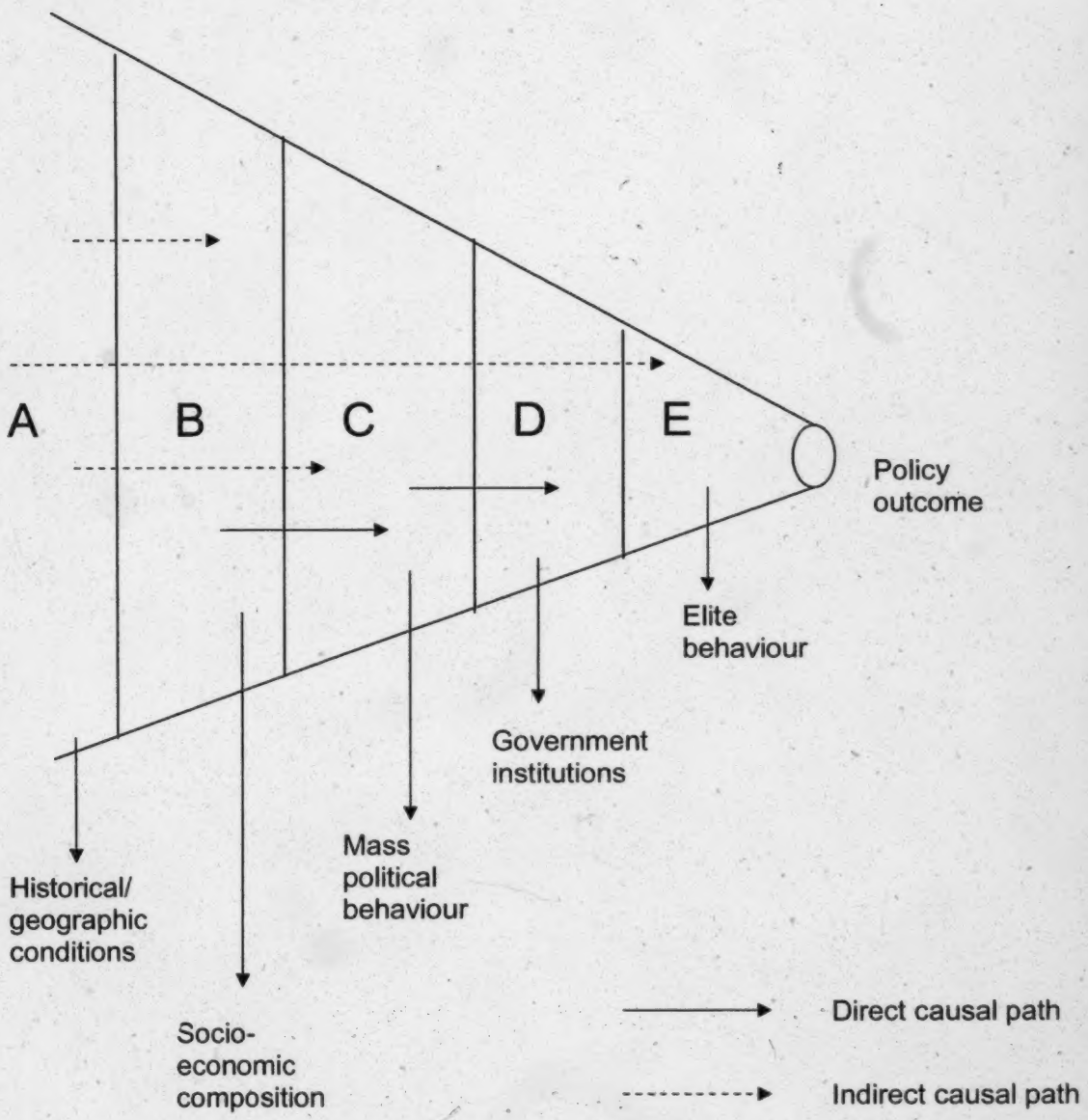
APPENDICES

Appendix A. Hofferbert's funnel of causality



Appendix B – Survey questionnaire and results from the Resource Management Policy and Climate Change Survey
(From: Wellstead *et al* 2004)

Your Province
Please indicate your location:

Alberta	36.7%
Saskatchewan	35.1%
Manitoba	16.0%
Outside the Prairies	11.2%

Your Work Focus
Please indicate the focus of your work (check all that apply):

Local	31.2%
Provincial	73.3%
Federal	30.1%
International	16.9%

Your Sector
Please indicate what sector your work is MOST actively involved with:

Agriculture	40.7%
Forestry	33.4%
Water resources	25.8%

Part One - Important Issues

Below is a list of issues related to provincial policy making within the agricultural, forestry, and water sectors. These issues have been identified in the literature as problems. Please indicate your assessment of the seriousness of each problem below. A score of 1 indicates not a problem for policymakers, while a score of 3 indicates somewhat of a problem, and a score of 5 indicates a very serious problem for policymakers. DK (9) indicates a response of don't know.

	Mean Scores
1. Uncompetitive agriculture industry	3.31
2. Declining quality of agricultural soils	3.40
3. Increased frequency of droughts on prairie agricultural lands	3.91
4. Soil erosion on prairie agricultural lands	3.44
5. Spread of foreign agricultural diseases	3.27
6. Loss of forest biodiversity	3.32
7. Protectionist trade policies	3.92
8. Greater demands by non-timber users (e.g., recreation, hunting, environmentalists)	3.18
9. Poor forest management practices	3.20
10. Greater frequency/severity of forest fires	3.33
11. Greater frequency/severity of insect damage in forested areas	3.31
12. Poor quality of prairie water supply for urban and/or agricultural users	3.82
13. Increased flooding	2.77
14. Water restrictions/shortages	3.64
15. Long-term climate change due to greenhouse gas emissions	3.65

Part Two. Important agricultural issues[45]

The following items express perceptions about Prairie agricultural issues. A score of 1 indicates strong disagreement with the statement, a score of 3 indicates a neutral response, while a 5 indicates strong agreement with the statement. NOp (9) indicates no opinion. Please respond from the perspective of your province/region.

1. The prairie agriculture industry can compete in global markets	3.88
2. Greater diversification into specialty crops and into intensive livestock operations is needed improve the viability of the prairie agriculture industry	3.88
3. The federal government should increase funding for farm subsidy programs	2.64
4. The provincial government in my province should increase funding for farm subsidy programs	2.45
5. An increase in irrigation systems is a feasible alternative to countering damage caused by droughts	2.57
6. Provincial crop insurance programs adequately protect prairie farmers from damage caused by droughts, flooding, and insects	2.73
7. The elimination of the CROW rate had a serious long-term negative effect on the competitiveness of the prairie agriculture industry	2.75
8. Downstream water supplies are adequately protected from agricultural operations	2.69
9. The decline of the family farm is a serious economic and social problem in my province	3.61
10. The best strategies for resolving most issues in my sector involve:	
a) Consensus-based negotiations among stakeholders	3.72
b) Reliance on existing regulations	2.61
c) Reliance on experts and professionals	3.25
d) Reliance on market-based instruments (e.g., carbon credit trading)	2.92
11. Communities and municipal governments should have more power in making decisions in my sector	2.88

[45] Respondents were asked only to answer questions relating to the sector they worked in.

12. Drainage of wetlands due to agricultural and other purposes is a critical issue 3.35

Part Two. Important Forestry Issues

The following items express perceptions about prairie forestry issues. A score of 1 indicates strong disagreement with the statement, a score of 3 indicates a neutral response, while a 5 indicates strong agreement with the statement. NOp (9) indicates no opinion. Please respond from the perspective of your province/region.

1. Current provincial forest legislation and policies promote sustainable forest management in my province 3.39

2. Species biodiversity is being threatened by current forest management practices 3.05

3. Forest practices that mimic natural disturbances are the best form of forest management strategy 3.67

4. The expansion of the forest industry will improve my province's economy 3.39

5. Forest fire suppression is adequate enough to prevent most major forest fires 3.05

6. Insect infestation suppression is inadequate (especially in the case of a large outbreak) 3.12

7. Environmental groups and the media tend to exaggerate the environmental damage caused by forest management practices 3.55

8. Forest companies should be given a wider range of private property rights on Crown lands 1.92

9. Fish and wildlife stocks in forested areas are in good health 3.03

10. The best strategies for resolving most issues in my sector involve:

a) Consensus-based negotiations among stakeholders 3.79

b) Reliance on existing regulations 2.71

c) Reliance on experts and professionals 3.58

d) Reliance on market-based instruments (e.g., carbon credit trading) 2.87

11. Communities and municipal governments should have more power in making decisions in my sector	2.93
12. Aboriginal concerns are adequately represented in forest related decisions	3.08
13. Forests are managed successfully for a wide range of uses and values, not just timber	3.32
14. My province has enough protected areas such as provincial and national parks or wilderness areas	2.97
15. Intensive forest management is a realistic forest management supplement to current practices	3.36
16. Forest regeneration practices are adequate	2.84
17. There will be sufficient forest growing stock in my province to meet future economic needs	2.92

Part Two. Important Water Issues

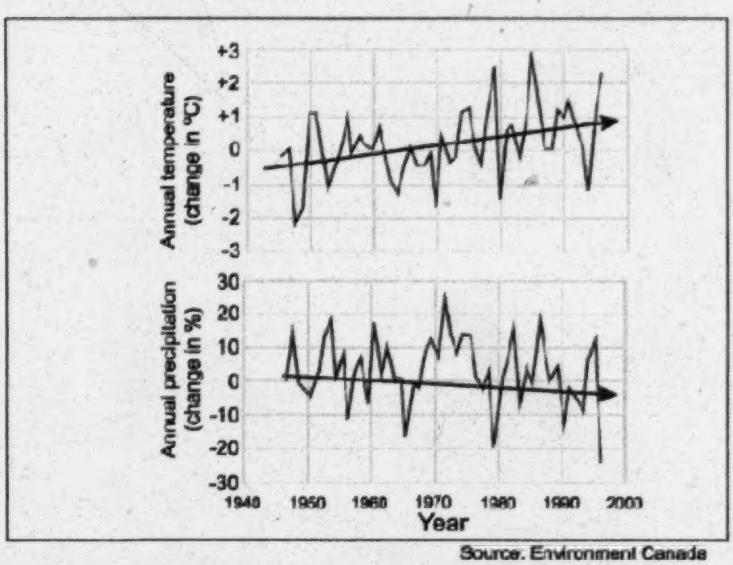
The following items express perceptions about prairie water issues. A score of 1 indicates strong disagreement with the statement, a score of 3 indicates a neutral response, while a 5 indicates strong agreement with the statement. NOp (9) indicates no opinion. Please respond from the perspective of your province/region.

1. There is an adequate supply of water available for all prairie resource users	2.22
2. Watersheds are adequately protected from forest operations	2.39
3. Water contamination from farm-related activity is a serious water problem	3.72
4. Water quality regulations are being adequately enforced	2.77
5. The Canada-U.S. Air Quality Agreement Act has been successful in addressing acid rain	2.92
6. Aborginal people should be accorded more control over water resources	2.54
7. Canadian drinking water guidelines/standards	

should be strengthened	3.48
8. Drainage of wetlands due to agricultural and other purposes is a critical issue	3.91
9. Water management should be based on demand management in order to promote water efficiency	3.52
10. The best strategies for resolving most issues in my sector involve:	
a) Consensus-based negotiations among stakeholders	3.80
b) Reliance on existing regulations	3.14
c) Reliance on experts and professionals	3.58
d) Reliance on market-based instruments (e.g., carbon-credit trading)	2.81
11. Communities and municipal governments should have more power in making decisions in my sector	3.07
12. The Federal government should allow bulk water exports	2.14

Part Three. The Science of Climate Change

Below are published graphs depicting average annual temperatures and precipitation for the Prairie Provinces over the past 60 years. The graph shows that the average temperature has increased by 1.6°C whereas precipitation may have declined. Please indicate how you interpret this data in the question below.



Source: Environment Canada

In my opinion, the above graphs are evidence of (choose one):

1. Substantial climate change and represent an important issue for my sector 32.8%

2. Substantial climate change but are not a critical issue for my sector 1.4

3. Modest climate change and represent an important issue for my sector 35.9

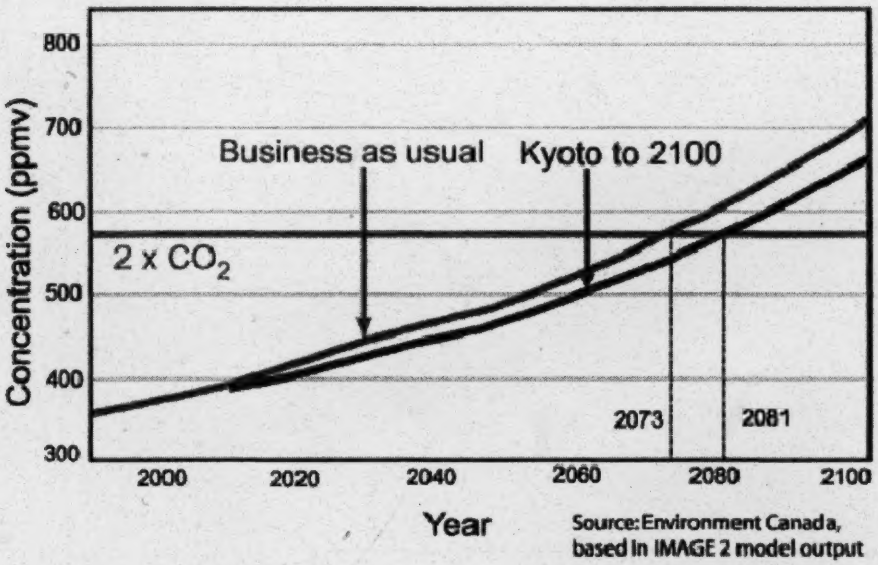
4. Modest climate change and are not a critical issue for my sector 5.5

5. No climate change and are not a critical issue for my sector 0

6. The data are inconclusive 21.3

7. Unsure 3.2

Part Three. The Science of Climate Change (continued)
In this graph, the added blue line indicates what would happen to the CO2 concentrations if the full Kyoto provisions for greenhouse gas reductions were adopted.



Based upon the evidence presented in the above graph: (choose 1)

1. In light of this evidence, reducing greenhouse gases under proposed Kyoto targets still remains an important long-term solution to mitigating climate change 13.7%

2. Reducing greenhouse gases under proposed targets is only a short-term solution in a larger strategy of climate change policy options, including adaptation 51.6

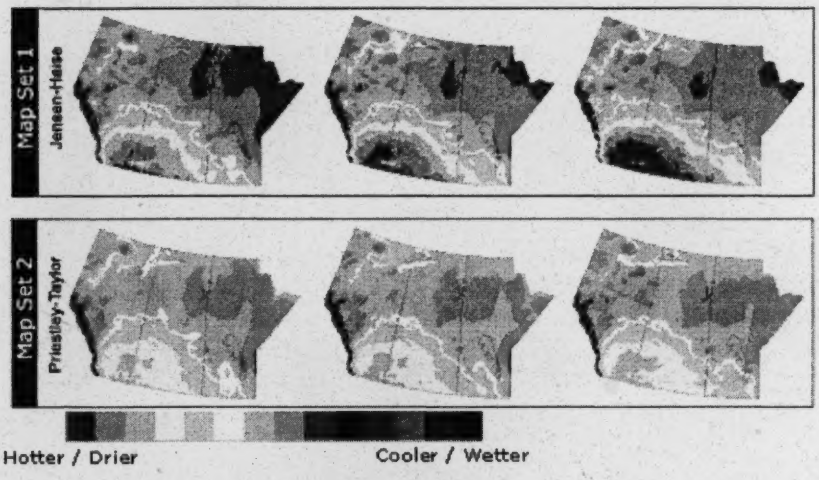
3. Reducing greenhouse gases under proposed targets will have very little impact on climate change mitigation 25.7

4. 2 x CO2 will not have a great impact on the prairie provinces 1.5

5. Unsure 7.6

Part Three. The Science of Climate Change (continued)
Scientists have developed complex computer simulations of future climates. Below are two common examples of these simulations that produce different possible future scenarios of projected climate conditions in the prairies over the next 70 years. Both Map Set 1 and 2 illustrate different Climatic Moisture Index (CMI) that take into account the drying power of the local climate. For more information about the CMI, Jensen-Haise, and Priestley-Taylor models click here.

In the legend below, the temperature and dryness is greatest where the colors in the maps are red, whereas purple indicates the cooler temperatures and wetter conditions.



From the maps above (please select one of the following):

1. Map Set 1 represents the most realistic outcome for future climate change	25.3%
2. Map Set 2 represents the most realistic outcome for future climate change	14.6
3. Neither Map Set is indicative of future climate change	12.6
4. Unsure	47.5

Part Three. The Science of Climate Change (continued)

By choosing Map Set 1, then you think that changes to the prairie climate will occur in the... (please select one of the following)

1. Short-term future (<10 years) and will have significant impacts requiring immediate policy action	27.0%
2. Short-term future (<10 years) and will have modest impacts requiring long term policy action	6.7
3. Long-term future (>10 years) and will have significant impacts requiring immediate policy action	47.2
4. Long-term future (>10 years) and will have significant impacts requiring long-term policy action	16.1
5. Long-term future (>10 years) and will have negligible impacts requiring little to no policy action	1.1
6. Unsure	1.1

n=89

Part Three. The Science of Climate Change (continued)

By choosing Map Set 2, then you think that changes to the prairie climate will occur in the... (please select one of the following)

1. Short-term future (<10 years) and will have significant impacts requiring immediate policy action 0%

2. Short-term future (<10 years) and will have modest impacts requiring long-term policy action
11.5

3. Long-term future (>10 years) and will have significant impacts
17.3
requiring immediate policy action

4. Long-term future (>10 years) and will have significant impacts
48.1
requiring long term policy action

5. Long-term future (>10 years) and will have negligible impacts
19.2
requiring little to no policy action

6. Unsure
3.8

n=52

The Science of Climate Change (continued)

By choosing neither map set, then you think... (please select one of the following)

1. Both maps underestimate potential climate change impacts	6.7%
2. Both maps overestimate potential climate change impacts	4.4
3. The data presented in both map sets is too inconclusive	37.8
4. All future scenarios developed by climate change science is too inconclusive to make policy decisions on	44.7
5. Unsure	6.7

n=45

Responsibility for Climate Change

Below we examine who you perceive to be responsible for climate change related impacts and adaptation on the prairies.

Who should be responsible for implementing climate change related IMPACT policies on the prairies? (check all that apply)

1. Individual consumers	61.8%
2. My department/organization	60.1
3. Private sector	69.4
4. Other provincial government departments	79.2
5. Other federal government departments	77.8
6. International government organizations	43.8
7. Nobody, it isn't an issue	1.7
8. Unsure	5.3

Who should be responsible for implementing climate change related ADAPTATION policies on the prairies? (check all that apply)

1. Individual consumers	59.6%
2. My department/organization	58.4
3. Private sector	79.8
4. Other provincial government departments	79.5
5. Other federal government departments	75.6
6. International governement organizations	33.7
7. Nobody, it isn't an issue	1.4
8. Unsure	3.9

Part Four. Risk and Resource Management
Below are four risk related issues associated with a number of potential impacts of climate change.

For each risk related issue, please indicate the severity of the impact.

Extent of Impacts

For each impact, please rate the extent of this impact in your resource sector. Where a score of 1 indicates a very small scope and 5 indicates a very large scope. NOp (9) indicates no opinion.

1. Decreased precipitation	4.43
2. Increased average temperatures	3.87
3. Increased precipitation	3.30
4. Increased severity of extreme weather events	4.00

Control of Impacts
For each impact, please rate how controllable each impact is in your resource sector. Where 1 indicates easy to adapt and 5 indicates difficult to adapt. NOp (9) indicates no opinion.

1. Decreased precipitation (droughts)	4.14
2. Increased average temperatures	3.32
3. Increased precipitation	2.78
4. Increased severity of extreme weather events	3.83

Acceptance of Impacts

For each impact, please rate how acceptable each impact is in your resource sector. Where 1 indicates easy to accept and 5 indicates difficult to accept. NOp (9) indicates no opinion.

1. Decreased precipitation (droughts)	4.27

2. Increased average temperatures	3.20
3. Increased precipitation	2.62
4. Increased severity of extreme weather events	3.75

Predictability of Impacts

For each risk, please rate the predictability of each potential impact upon your resource sector. Where 1 indicates very little predicability and 5 indicates a great deal of predicability. NOp indicates no opinion.

1. Decreased precipitation (droughts)	3.16
2. Increased average temperatures	3.18
3. Increased precipitation	2.88
4. Increased severity of extreme weather events	2.55

Part Five. Organizational Issues

In developing your strategies for dealing with prairie resource issues, please indicate from the list below up to three (3) organizations on which you rely most heavily. Then indicate why you rely on them in determining your strategies. For each organization, please rank each of the four reasons listed below on a scale from 1 indicates not at all important 5 indicates extremely important.

- Shared Values/Policy Viewpoints
- Source of Valid Information
- Source of Innovative Ideas
- Organization has a lot of power

Choose from:

- Agriculture and Agri-Food Canada
- Prairie Farm Rehabilitation Administration
- Canada Grains Council
- Canadian Meat Council
- Canadian Cattlemen's Association
- Canadian Federation of Agriculture
- Canadian Pork Council
- Canadian Seed Growers' Association
- Canadian Special Crops Association
- Canadian Canola Growers Association
- Canola Council of Canada
- Con Agra Grain
- Crop Protection Institute
- Farm Credit Corporation
- United Grain Growers
- Western Barley Growers
- Western Canadian Wheat Growers
- Canadian Society for Soil Science
- Alberta Grain Commission
- Agricore
- Agriculture and Food Council of Alberta
- Alberta Barley Commission
- Alberta Canola Producers Commission
- Alberta Cattle Commission
- Alberta Cattle Feeders' Association
- Alberta Irrigation Projects Association
- Alberta Pulse Growers Commission
- Alberta Winter Wheat Producers Commission
- Wild Rose Agricultural Producers

- Alberta Institute of Agrologists
- Alberta Applied Research Association
- University of Alberta
- University of Calgary
- University of Lethbridge
- Alberta Conservation Tillage Association
- Saskatchewan Agriculture and Food
- Saskatchewan Crop Insurance Corporation
- Saskatchewan Canola Growers Association
- Saskatchewan Cattle Feeders Association
- Saskatchewan Pulse Growers
- Saskatchewan Wheat Pool
- Saskatchewan Winter Cereal Growers
- Saskatchewan Institute of Agrologists
- University of Regina
- University of Saskatchewan
- Saskatchewan Soil Conservation Association
- Manitoba Agriculture
- Manitoba Crop Insurance Corporation
- Keystone Agricultural Producers
- Manitoba Canola Growers Association
- Manitoba Cattle Producers Association
- Manitoba Chicken Producers
- Manitoba Forage Council
- Manitoba Seed Growers' Association
- Manitoba Institute of Agrologists
- University of Manitoba
- University of Winnipeg
- Environment Canada
- Environmental Conservation Service
- Environmental Protection Service
- Meteorological Service of Canada
- Natural Resources Canada
- Climate Change Secretariat
- Geological Survey of Canada
- Canadian Aquaculture Industry Alliance
- Canadian Water Resources Association
- Canadian Water and Wastewater Association
- Western Canada Water and Wastewater Association
- Western Canada Water Environment Association
- Alberta Water and Wastewater Operators
- Association of Professional Engineeers, Geologists
- Canadian Nature Federation
- David Suzuki Foundation

- Environment Probe
- Friends of the Earth
- Greenpeace
- Sierra Club
- Western Canada Wilderness Committee
- World Wildlife Fund
- Alberta Environment
- Climate Change Central
- Alberta Environmental Network
- Alberta Fish and Game Association
- Alberta Fish Farmers Association
- Alberta Soil and Water Conservation Society
- Pembina Institute
- Friends of the Athabasca
- Ducks Unlimited
- Trout Unlimited
- Prairie Association for Water Management
- Saskatchewan Environment and Resource Management
- Saskatchewan Water and Wastewater Association
- Saskatchewan Water Corporation
- Saskatchewan Wetland Conservation Corporation
- Meewasin Valley Authority
- Saskatchewan Ground Water Association
- Soil and Water Conservation Society
- Saskatchewan Environmental Society
- Manitoba Conservation
- Delta Waterfowl Foundation
- Waterwatch
- Manitoba Eco-Network
- Assembly of First Nations
- Metis National Council
- Canadian Aboriginal Science and Technology Society
- Treaty 7 Tribal Council
- Metis Nation of Alberta
- Federation of Saskatchewan Indian Nations
- Manitoba Keewatinowi Okimakanak
- Centre for Indigenous Environmental Resources
- Assembly of Manitoba Chiefs

- Canadian Forest Service
- Canadian Pulp and Paper Association
- Canadian Sustainable Forestry Certification Association
- Council of Forest Industries
- Pulp and Paper Research Institute of Canada
- Forest Engineering Research Institute
- Canadian Lumbermean's Association
- Canadian Institute of Forestry
- International Institute for Sustainable Development
- Canadian Forestry Association
- Canadian Parks and Wilderness Association
- Forest Stewardship Council
- Land and Forest Service
- Alberta Forest Products Association
- Sundance Forest Industries
- Alberta Newsprint Company
- Alberta Pacifc Ltd.
- Canfor Ltd.
- Daishowa-Marubeni International Ltd.
- Manning Diversified Forest Products
- Millar Western Forest Products Ltd.
- Tolko Industries Ltd.
- Weldwood of Canada Ltd.
- Weyerhaeuser Company
- Alberta Registered Professional Foresters
- Alberta Society of Professional Biologists
- Canadian Institute of Forestry
- Foothills Model Forest
- National Centre of Excellence
- Alberta Wilderness Association
- Federation of Alberta Naturalists
- Saskatchewan Environment and Resource Management
- Council of Saskatchewan Forest Industries
- Saskatchewan Council of Independent Forest Industries
- Central Forest Products Association
- Clearwater Forest Products
- Mistik Management
- NorSask Forest Products Partnership
- Suntec Forest Products
- Saskatchewan Environmental Managers Association
- Prince Albert Model Forest
- Saskatchewan Forest Conservation Network
- Native Plant Society of Saskatchewan

- Nature Saskatchewan
- Saskatchewan Forestry Association
- Saskatchewan Action Foundation for the Environment
- Saskatchewan Eco-Network
- Manitoba Model Forest
- Manitoba Forestry Association
- Manitoba Future Forest Alliance

From the same list, please identify up to three (3) organizations you regard as allies. For each group, please indicate how often you engage in the following four activities with that group. Indicate according to the scale below from 1 indicates never 5 indicates very often.

- Share information
- Voluntarily modify my organization's behaviour to achieve common goals
- Develop a joint policy position and/or strategy

Please indicate up to three (3) organizations you regard as your principal opposition.

Part Six. General Policy Attitudes

The following statements express general opinions about government, institutions, public policies, and the environment. Please circle the number that comes closest to expressing your opinion on a scale from 1 indicates strongly disagree to 5 indicates strongly agree. NOp (9) indicates no opinion.

	Mean
1. A first consideration of any good political system is the protection of property rights	3.26
2. The balance of nature is very delicate and easily upset by human activities	3.59
3. The best government is the one that governs the least	2.77
4. Ecological rather than economic factors must guide our use of natural resources	3.30
5. Decisions about development are best left to the economic market	2.33
6. We attach too much importance to economic measures on the well-being of our society	3.40
7. We are approaching the limit of the number of people the earth can support	3.33
8. When humans interfere with nature it often produces disastrous	

consequences	3.25
9. Humans must live in harmony with nature in order to survive	4.14
10. Most environmental problems can be solved by applying more and better technology	2.76
11. Plants and animals exist primarily to be used by humans	2.28
12. There are limits to growth beyond which our industrialized society cannot expand	3.93

Part Seven. About You

In the final section are background socio-demographic questions relating to your age, gender, occupation, and education.

1. What is your principal occupation / profession?

- Business person 1.8
- Attorney 0.3
- Consultant 4.8
- Planner/Architect 2.1
- Engineer Scientist 14.0
- Manager 22.3
- Journalist 0.3
- Farmer 3.3
- Professional Forester 6.7
- Agrologist 10.4
- Civil Servant 25.6
- Elected official 1.8

2. How many years have you been in your present organization?

- less than 1 year 6.2%
- 1-5 years 21.5
- 6-9 years 15.3
- 10-14 years 13.6
- 15-20 years 13.0
- greater than 20 years 30.4

3. Which of the following best describes your principal employer(s)?

- Agricultural producer organization 9.5
- Forest industry organization 5.7
- University 6.3
- Government agency 61.0
- Environmental organization 5.7
- Fishing or sport club 0.3
- Consulting firm 3.3
- Self-employed 6.8
- Corporation 1.5

4. What is your age?

- Under 21 0.3
- 21-30 7.3
- 31-40 17.7
- 41-50 39.1
- 51-60 30.3
- Over 60 5.2

5. What is the highest level of education you have attained?

- Not a high school graduate 0.6
- High school graduate 1.7
- Some college 10.4
- Bachelor's degree 33.1
- Law Degree (LL.B.) 0.6
- Master's or professional degree 33.7
- Ph.D. or MD 14.3

6. If you have a university degree, in which of the following fields is it?

- Agriculture 22.0
- Physics 2.4
- Chemistry 2.1
- Forestry 11.0
- Engineering 12.4
- Earth/resource sciences 12.4
- Biology or ecology 15.8
- Economics 6.9
- Law 0.7
- Planning 4.1
- Other social sciences 5.5
- Education 2.1

- Humanities or fine arts

7. What is your gender?

- Male 82.2%
- Female 17.8

8. What is your family status?

- Single Married or Common law without children 11.9
- Married or Common law with children 73.3
- Separated or Divorced without children 1.5
- Separated or Divorced with children 3.0
- Widowed 0.9

Appendix C. Three basic equations of a structural equation model and their coefficient and covariance matrices

Structural equation models contain three basic equations containing four matrices of coefficients and four covariance matrices. Equation 1 reveals all of the direct effects among the endogenous and exogenous concepts (or latent variables). Endogenous concepts are those concepts directly caused or influenced by other concepts, whereas exogenous concepts always act as the cause. The analysis of the covariance structures procedure assumes that the "true" dependent variables (endogenous), η, are related to the ξ, true independent (exogenous) variables, by a system of structural equations (Equation 1). In this study, the dependent variables were organizationally defined informal coordination variables and concern for climate change whereas the independent variables were the organizational membership/policy belief cluster and sectoral location. A complete listing of all the models' variables is listed in Table 4-7.

$$\eta = B_{\eta} + \Gamma\xi + \zeta \qquad \text{(Equation 1)}$$

In this equation, B is a coefficient matrix of relationships among the dependent variables, Γ is the matrix of causal effects of the independent on the dependent variables, and ζ is a residual vector for errors in equations. By setting various elements of the β and Γ matrices to zero, the researcher can designate the absence of causal relationships. Similarly, the presence or absence of correlations among elements of ζ can be controlled as indicated by theoretical requirements. The subscripted B's (β) and Γ's (γ) are used to represent each structural coefficient in Equation 2. Therefore, β_{21} in Equation 2 has a coefficient score of -.156 in Figure 1.

$$\begin{bmatrix} n_1 \\ n_2 \\ n_3 \\ \cdot \\ \cdot \\ n_m \end{bmatrix} = \begin{bmatrix} 0 & \beta_{12} & \beta_{13} & \\ \beta_{21} & 0 & \beta_{23} & \\ \beta_{31} & \beta_{32} & 0 & \\ \vdots & & & \\ \vdots & & & \\ \vdots & & & \end{bmatrix} \begin{bmatrix} n_1 \\ n_2 \\ n_3 \\ \cdot \\ \cdot \\ n_m \end{bmatrix} + \begin{bmatrix} 0 & \gamma_{12} & \gamma_{13} & \\ \gamma_{21} & 0 & \gamma_{23} & \\ \gamma_{31} & \gamma_{32} & 0 & \\ \vdots & & & \\ \vdots & & & \\ \vdots & & & \end{bmatrix} \begin{bmatrix} \xi_1 \\ \xi_1 \\ \xi_1 \\ \vdots \\ \vdots \\ \vdots \end{bmatrix} + \begin{bmatrix} \zeta_1 \\ \zeta_1 \\ \zeta_1 \\ \vdots \\ \vdots \\ \vdots \end{bmatrix} \qquad \text{(Equation 2)}$$

Because both the latent η's and ξ's are assumed to be unobserved, the observed measures in the model consist of vectors of y indicators of η's and x indicators of ξ's related to the true variables by the measurement equations. Equation 3 and Equation 5 link the endogenous and exogenous concepts to the respective endogenous and exogenous concepts. The entries in the Λ (lambda) matrices are lowercase lambdas (λ). The Lambda matrix (Λ) has paths going from the latent λ variables to the observed x and y variables. The measurement error variables are denoted by ϵ and δ. There are four other matrices. The theta sub delta (Θ_{δ}) matrix is the vector of error in the measurement model for the observed x variables; the theta sub epsilon (Θ_{ε}) matrix is the vector of error in the measurement model for the observed y variables; the phi

matrix (Φ) is the variance-covariance matrix for the exogenous concepts (ξ); and the psi matrix (Ψ) is the covariance among the errors in conceptual model.

$$y = \Lambda_y \xi + \delta \qquad \text{(Equation 3)}$$

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ \vdots \\ \vdots \\ y^p \end{bmatrix} = \begin{bmatrix} \lambda^y_{11} \lambda^y_{12} \lambda^y_{13} \\ \lambda^y_{21} \lambda^y_{22} \lambda^y_{23} \\ \lambda^y_{31} \lambda^y_{32} \lambda^y_{33} \\ \vdots \\ \vdots \\ \vdots \end{bmatrix} \begin{bmatrix} n_1 \\ n_2 \\ n_3 \\ \vdots \\ \vdots \\ n_m \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \vdots \\ \\ \varepsilon_q \end{bmatrix} \qquad \text{(Equation 4)}$$

$$x = \Lambda_x \xi + \delta \qquad \text{(Equation 5)}$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ \vdots \\ x^q \end{bmatrix} = \begin{bmatrix} \lambda^x_{11} \lambda^x_{12} \lambda^x_{13} \cdots \\ \lambda^x_{21} \lambda^x_{22} \lambda^x_{23} \cdots \\ \lambda^x_{31} \lambda^x_{32} \lambda^x_{33} \cdots \\ \\ \end{bmatrix} \begin{bmatrix} n_1 \\ n_2 \\ n_3 \\ . \\ n_m \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ . \\ \delta_q \end{bmatrix} \qquad \text{(Equation 6)}$$

In Chapter three's results section, the gamma (γ) and beta (β) symbols denote the paths in Figures 1-3. The above structural equations and corresponding matrices are the tools required to derive how the maximum likelihood estimates of the model's coefficients can be obtained by comparing the actual co-variances among the indicators (S) with the co variances implied by the model (Σ) (Hayduk 1987).

Appendix D – Tabular results of informal networks

Table B-1. Organizations regarded as allies (sharing information, developing joint policy positions, voluntarily modifying organization's behavior)

	Federal Gov't	Provincial Gov't	Industry	Research	Environment	Total
Federal Gov't	56	105	43	26	9	239
Provincial Gov't	16	96	34	16	6	168
Industry	15	38	58	8	2	121
Research	19	63	20	21	5	128
Environment Groups	16	28	3	5	11	63
Other	6	13	4	0	4	27
Total	128	343	162	76	37	746

Table B-2 Organizations regarded as allies (sharing information, developing joint policy positions, voluntarily modifying organization's behavior) (Based on the ratio between the respondent's organization and the identified organization)

	Federal Gov't	Provincial Gov't	Industry	Research	Environment	Total
Federal Gov't	.46	.32	.27	.34	.27	.35
Provincial Gov't	.13	.29	.22	.21	.18	.25
Industry	.12	.12	.37	.11	.06	.19
Research	.16	.19	.13	.28	.15	.20
Environment Groups	.13	.08	.02	.07	.33	.10

Table B-3. Organizations regarded as opposition

	Federal Gov't	Provincial Gov't	Industry	Research	Environment	Total
Federal Gov't	6	13	7	5	1	32
Prov Gov't	6	5	2	2	3	18
Industry	12	38	34	11	11	106
Research	4	5	4	4	0	17
Environment Groups	21	64	41	8	2	136
Other	20	25	9	7	5	66
Total	69	150	97	37	22	375

Appendix E – Factor scores: Structure of deep normative policy core beliefs

	Component	
Deep normative core beliefs	Alpha 0.784	Alpha 0.621
Protection of property rights		0.725
Balance of nature is delicate	0.600	
Best government is the one the governs the least		0.691
Ecological factors should guide natural resource use	0.638	
Too much importance attached to economic measures	0.607	
Must limit the number of people on earth	0.619	
Humans must live in harmony with nature	0.609	
More technology can solve environmental problems		0.636
Plants and animals exist primarily to be used by humans		0.606
There is a limit to growth	0.688	